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**RISK OF DECOMPRESSION SICKNESS  
IN SHALLOW NO-STOP AIR DIVING:  
AN ANALYSIS OF NAVAL SAFETY CENTER DATA  
1990-1994**

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## **TECHNICAL REVIEW AND APPROVAL**

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The experiments reported herein were conducted according to the principles set forth in the current edition of the "Guide for the Care and Use of Laboratory Animals," Institute of Laboratory Animals Resources, National Research Council.

This technical report has been reviewed by the NMRI scientific and public affairs staff and is approved for publication. It is releasable to the National Technical Information Service where it will be available to the general public, including foreign nations.

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13. ABSTRACT (Maximum 200 words) <p>Naval Safety Center (NSC) dive and incident reports for calendar years 1990-1994 were analyzed to determine the risk of decompression sickness (DCS) in shallow no-stop air diving using current U.S. Navy no-decompression limits (USN57). Navy and Marine Corp divers performed 163,400 no-decompression dives between 21 and 55 feet of sea water (fsw) during this period and reported 48 incidents that could be interpreted as DCS. The overall DCS rate was 0.29 cases/1000 dives. There was a clear pattern of increasing DCS risk with increasing bottom time. The DCS rate in the 4th quartile of USN57 no-decompression time (1.28 cases/1000 dives) was nearly six times the rate in the 1st quartile (0.22 cases/1000 dives). Nevertheless, the DCS rate even in the 4th quartile of USN57 no-decompression time was still quite low in absolute terms.</p> <p>The majority of the 48 incidents reported to NSC were labelled Type II DCS. This is in marked contrast to previous reports of military diving operations where Type I cases predominate.</p>				
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The potential impact of adopting new and more restrictive no-decompression limits (USN93) was examined. If the new limits were adopted in the context of single-level dive tables similar to the current Standard Air Tables, and if the pattern of Navy diving remained unchanged, approximately 2.9% of the no-decompression dives conducted between 21 and 55 fsw would be converted to decompression-requiring dives. Approximately 954 dives would be affected annually, adding 419 hours of decompression time to operations each year assuming the decompression was computed using the proposed new USN93 tables. This is an average of 26.3 minutes of decompression for each dive over the new limit. The observed DCS case rate for dives over the proposed USN93 limit is 1.26 cases/1000 dives, a rate very similar to the USN57 4th quartile rate. With the institution of decompression for these dives, the DCS case rate could be expected to fall from 1.26 cases/1000 dives to 1.07 cases/1000 dives, a 15% reduction. In absolute terms, this is an expected reduction of 0.18 case/year.

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## BACKGROUND

During the 1980s, surveys of operational diving practice (1-4) as well as experimental work at NEDU (5) demonstrated that decompression was inadequate for long, deep air dives. When performed with either in-water decompression or surface decompression techniques, these dives were associated with an unacceptable bends rate (5). Experimentally, Thalmann demonstrated that a 150 feet of sea water (fsw) for 40 min dive or a 190 fsw for 30 min dive required 1.6 times the decompression time called for in the U.S. Navy Standard Air Decompression Table (USN57). Similarly, a 60 fsw/180 min dive required 2.7 times as much decompression (5). In the mid 1980's, concern about the safety of air decompression was so great that the U.K. Department of Energy issued two Diving Safety Memoranda (6) that severely restricted the depth-time envelope for air diving in the North Sea.

In response to these concerns, and to restore the operational envelope for air diving, new decompression models and procedures were developed by several groups including the U.S. Navy, the French Navy, COMEX S.A. (subsequently adopted by the French Ministry of Health), the Canadian Forces, the University of Pennsylvania (for the U.K. Health and Safety Executive and SubSea International, Inc.), and Duke University (for its support of Turkish archaeological expeditions). Some of these new decompression models continued with the traditional Haldanian (17) approach while others incorporated probabilistic features and risk based on computed bubble dynamics.

The U.S. Navy developed and extensively tested a new probabilistic decompression model in 1993 (7-9). This model, referred to as USN93, produced a new set of air decompression procedures that corrected perceived deficiencies in the decompression from long, deep dives. However, this model also shortened the allowed no-decompression bottom times for shallow dives when compared to USN57. At 40 fsw, for example, USN93 shortened the no-decompression limit from 200 minutes to 144 minutes. At 35 fsw, the no-decompression limit was shortened from 310 to 185 minutes. Table 1 summarizes the changes.

The USN93 model recommendations for shortening the shallow no-decompression limits were consistent with the recommendations of others. The new COMEX tables set a no-



decompression limit of 165 minutes at 40 fsw, while the new University of Pennsylvania tables allowed only 120 minutes. Nevertheless, the need for shorter no-decompression limits was seriously questioned by the Fleet (10). The Fleet maintained that no-decompression diving in the U.S. Navy had an excellent safety record and that shorter no-decompression limits were both mission-compromising and unnecessary.

As a part of its review of USN93-based decompression procedures for Fleet introduction, the Naval Sea Systems Command (NAVSEA) (11) requested that the Naval Medical Research Institute (NMRI) assess the historical DCS rate for shallow, no-decompression air diving in the U.S. Navy using the USN57 procedures. This paper reports the results of that assessment and estimates the potential impact of adopting the USN93 no-decompression limits.

**Table 1**  
Comparison of USN57 and USN93 No-Decompression Limits  
for Shallow Water Air Diving

<b>Depth Range (fsw)</b>	<b>USN57 (min)</b>	<b>USN93 (min)</b>
21-25	Unlimited	338
26-30	Unlimited	245
31-35	310	185
36-40	200	144
41-45	100	114
46-50	100	93
51-55	60	77
56-60	60	64

## METHODS

The assessment was performed using data archived in the Naval Safety Center (NSC). The NSC was asked to identify all air dives in its database that met the following criteria:

- a. Were performed in the five-year period between 01 January 1990 and 31 December 1994.
- b. Were performed by Navy, Marine, Reserve, or Civilian divers as coded in Box A-10 of DD Form 2544.
- c. Were performed in open water as coded in Box B-16.
- d. Were to a maximum depth of 21-55 fsw as coded in Box B-29.
- e. Were labelled as "Air Diving, No-decompression", code "A" in Box C-34.

Dives reported to NSC by other Department of Defense components (e.g. Army, Coast Guard) were not included because incident reporting for these components was felt to be incomplete (M. Bonnin, NSC; personal communication).

Once received from NSC, the data set was scanned for possible errors including duplicate entries, dives with a breathing apparatus not compatible with air diving (LAR V, Mark 15, Mark 16), dives not on 21% oxygen or showing helium in Box B-26, and dives with bottom times exceeding the air no-decompression limits. Dives failing to pass these additional screens were deleted and the remaining dives were aggregated into a spreadsheet in depth increments of 5 fsw from 21-55 fsw and in time increments of both 1 and 10 minutes from 0-360 min. For dives in the 21-25 fsw and 26-30 fsw depth ranges, additional time categories of 6-8 h, 8-10 h, 10-12 h and >12 h were added to accommodate dives longer than 360 min. From this spreadsheet, frequency distributions of dives by depth, bottom time and performer were created.

The NSC was also asked to provide copies of all incident reports bearing a diagnosis of either decompression sickness or arterial gas embolism for the period 01 January 1990 to 31 December 1994. These reports were examined to select those incidents that occurred on open-water, air, no-decompression dives between 21 and 55 fsw. These incidents were then reviewed by a panel of five NMRI undersea medical officers who segregated them by consensus vote into one of three categories: (1) Definitely Decompression Illness (DCI), (2) Definitely not DCI, and (3) Uncertain whether it is DCI or not. Category 1, Definitely DCI, was further divided into three subclasses: (a) Decompression Sickness (DCS), (b) Arterial Gas

Embolism (AGE), and (c) DCS or AGE. This categorization scheme recognizes the fact that it is frequently impossible to tell whether an illness observed following decompression represents DCS or AGE (12). The selected incidents were also checked against the dive database to ascertain that the causative dive was included in the database and the depths and bottom times of the dive and the accident reports matched.

Prior to any analyses, all incidents categorized as Definitely not DCI by the panel of undersea medical officers were eliminated from the data set. Also, those incidents where both NSC and the panel of undersea medical officers agreed that the case was a definite AGE were eliminated. This left only those cases where the diagnosis was either (1) Definite Decompression Sickness or (2) Possible Decompression Sickness. All equivocal cases that might have been decompression sickness were thus retained in the analysis.

The DCS rate was computed by dividing the number of cases observed by the number of dives performed, then multiplying the quotient by 1000 to express the rate in cases/1000 dives. The DCS rate was computed by depth band alone (*e.g.*, 21-25 fsw), by depth band and whether the dive was shorter or longer than the USN93 no-decompression limit, and by depth band and whether this dive was in the first, second, third, or fourth quartile of the USN57 no-decompression time. Rates across depth bands were also computed. The relative risk of one condition compared with another was computed by dividing the rate in that condition by the rate in the reference condition. Tests of statistical significance were not conducted because of the small number of DCS cases in the data set.

## **RESULTS**

The NSC identified 166,443 dives based on the criteria (a - e) outlined above. Of these dives, 863 were found to be duplicate entries, 223 to have bottom times exceeding the current no-decompression limit, and 1,957 that were not entirely air dives. These invalid entries represented approximately 2% of the data received from NSC and when they were eliminated from the data set, 163,400 dives remained for analysis. The refinement of the NSC data set is summarized in Table 2.

**Table 2**  
Refinement of the Naval Safety Center Data set

<b>Initial NSC Total</b>	<b>166,443</b>
Eliminate Non-Air Dives	
LAR V                      1154	
Mark 15                    414	
Mark 16                    287	
SL-17, 100% O <sub>2</sub> 90	
HeO <sub>2</sub> 12	
	<b>-1,957</b>
Eliminate Dives Longer than No-D Limit	
	<b>-223</b>
Eliminate Duplicate Entries	
	<b>-863</b>
<b>Final NSC Total</b>	<b>163,400</b>

Duplicate entries represented one-half of one percent of the data set. Usually two entries were made, one with the diver's full name and one with his initials. In one instance, two dives with the same diver had an identical date and surfacing time, but the time recorded for leaving the surface differed by 2 minutes.

A number of dives (n=223; 31-55 fsw) listed as "no-decompression" actually exceeded the USN57 no-decompression limit. In some instances, the reported bottom time was just over the limit. Some reported dives, however, were well over the limit. At 36-40 fsw, for example, 16 dives were reported with bottom times of 271-290 minutes (No-decompression limit = 200 min). Across the depth range of 31-55 fsw, 28 "no-decompression" dives were reported with bottom times in excess of 6 hours!

A unique situation was discovered in 32 records. In these records, the day of the month the dive was performed was entered into the day column of the bottom time field, resulting, for example, in a no-decompression dive to 32 fsw for 23 days, 0 hours, and 13 minutes. Such errors were corrected and these dives were retained in the database. They are not part of the 223 dives over the limit described above.

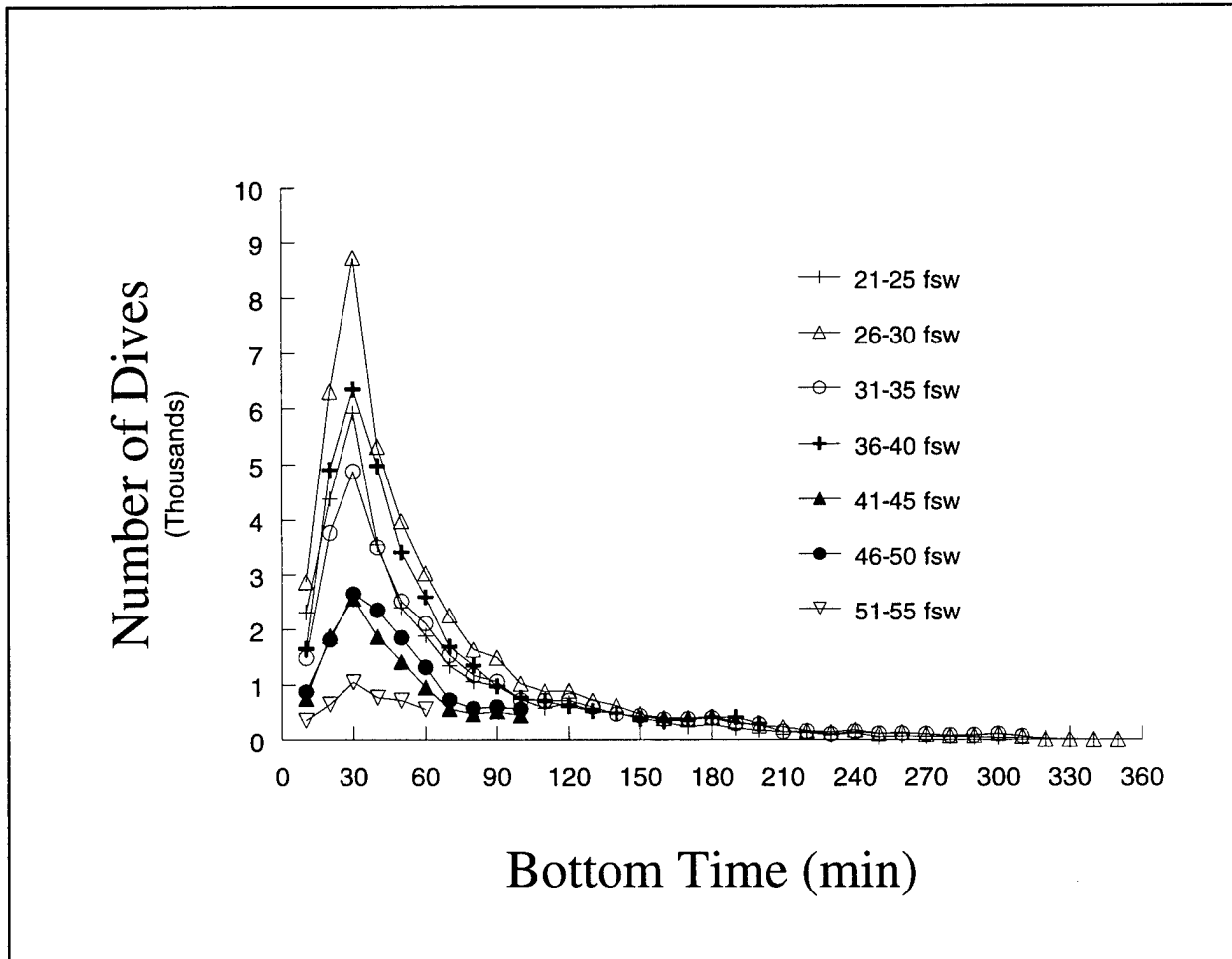
Dives performed with the LAR V, Mark 15, and Mark 16 and listed as air no-decompression may have been SPECWAR dives in which these rigs were used for part of the time in what otherwise was an air dive. Alternatively, they may have been no-decompression dives no those respective rigs in which code "A" in Box C-34 of DD 2544 was checked in error. No attempt was made to verify the nature of these dives. They were eliminated from the dataset.

Table 3 shows the distribution of the 163,400 dives by depth range and performer. More detailed information is given in Appendix A. The greatest number of dives occurred in the 26-30 fsw depth range. Eighty-two percent of the dives were between 21 and 40 fsw. Active duty and civilian Navy divers performed more than 90% of the dives. Within Navy, the ratio of active duty dives to civilian dives was approximately 3 to 1.

**Table 3**  
Distribution of Dives by Depth Range and Performer

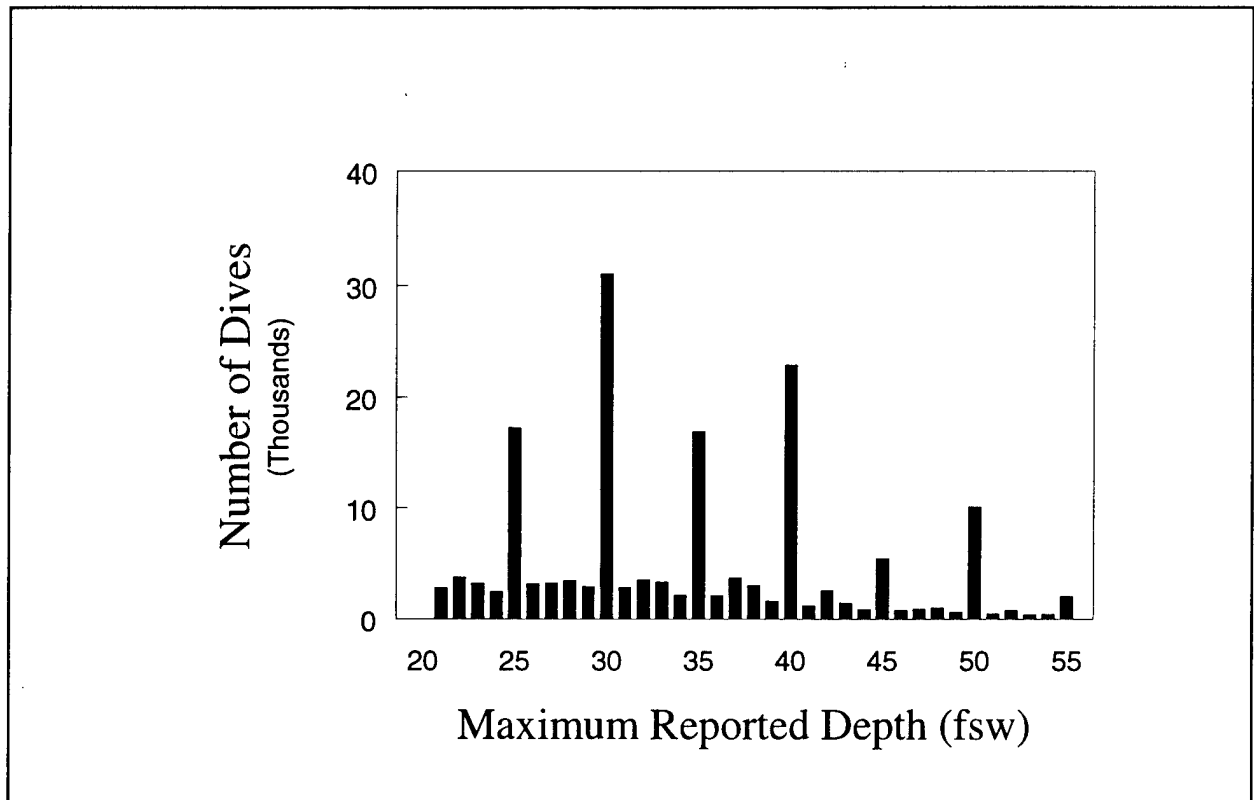
Depth Range (fsw)	Total Dives	Navy	Civilian	Marine	Reserve
		(% within depth range)			
21-25	29,325	75.8	13.4	4.7	6.2
26-30	43,455	68.0	24.7	2.4	4.9
31-35	28,621	72.4	22.2	1.8	3.5
36-40	33,198	64.1	29.8	1.7	4.4
41-45	11,415	75.6	18.0	1.8	4.6
46-50	13,302	65.2	28.5	2.0	4.2
51-55	4,084	78.5	12.2	3.6	5.7
Total	163,400	70.0	22.8	2.5	4.7

Figure 1 shows the frequency distribution of dives across all performers as a function of bottom time. For all depth ranges under study, the frequency rises rapidly with increasing bottom time, reaching a peak at 21-30 minutes. Frequency then declines with a long tail until the no-decompression time is reached. A secondary peak in dive frequency is not seen as the no-decompression limit is approached. This suggests that divers are not pushing the no-decompression limit. Appendix A gives a further breakdown of these time distributions by category of performer.



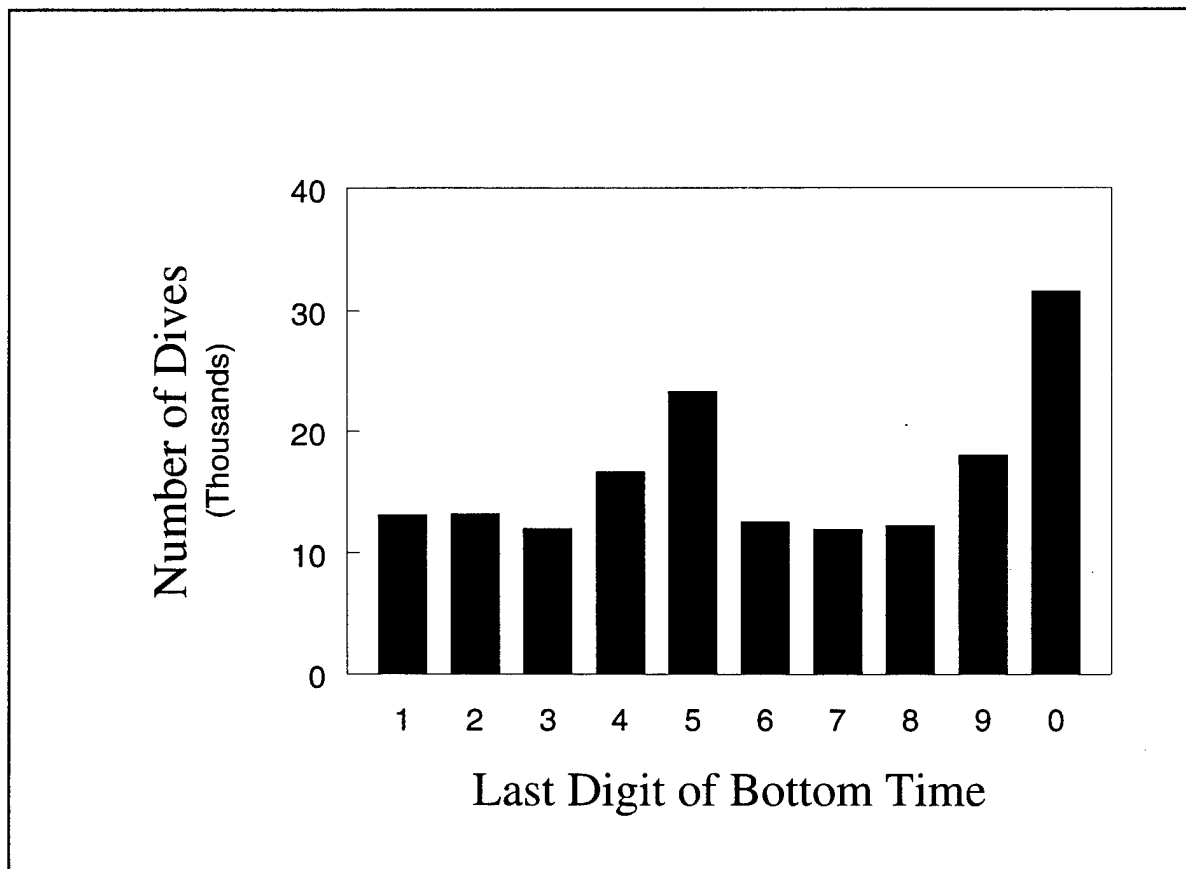
**Figure 1.** Frequency Distribution of No-Decompression Dives as a Function of Bottom Time. The number of dives performed in each 10 minute increment of bottom time from zero to the USN57 limit is shown for all 7 depth ranges studied. Numbers are the sum of values for Navy, Civilian, Marine, and Reserve divers. At all depths the highest frequency is observed between 21 and 30 min of bottom time.

Figure 2 shows the frequency distribution of dives by the maximum reported depth (Box B-29, DD 2544). Substantial spikes in dive frequency are observed at increments of 5 and 10 fsw, suggesting rounding up of the actual maximum depth of the dive to the next deeper 5- or 10-fsw depth. Spikes at the 10-fsw mark consistently exceed those at the 5-fsw mark, suggesting further that rounding up to the next deeper 10-fsw depth is the more common practice.



**Figure 2.** Frequency Distribution of Dives by Maximum Reported Depth. Pronounced peaks are observed at 5- and 10-fsw intervals indicating rounding up of maximum depth to the next 5- or 10-fsw mark.

Figure 3 shows the frequency distribution of dives by the last digit of the reported bottom time (Box B-30, DD 2544). Zero represents dives of 10, 20, 30 min, etc, while 5 represents dives of 5, 15, 25 min, etc. A substantial spike is present at 0, suggesting rounding up the bottom time to the next 10-minute mark. There also appears to be some rounding up to the next 5 minutes as well, although the evidence for this is less strong.



**Figure 3.** Frequency Distribution of Dives by Last Digit of Reported Bottom Time. The highest frequencies are observed at 5 and 0 suggesting some rounding up of bottom time to the next 5 or 10 minute mark.

For dives to 30 fsw and shallower, the USN57 no-decompression limit is infinite. Table 4 shows the number of dives between 21 and 30 fsw that were reported to be greater than 6-hours duration. Fifty-eight dives were identified in this category; 11 of these dives had reported durations greater than 12 hours.

Table 5 shows the number of dives reported between the USN93 no-decompression



limit and the USN57 limit for the depth range indicated. The blank entries for 41-45 and 51-55 fsw reflect the fact that the USN93 limit is more permissive than the USN57 limit in these ranges. All dives conducted between the USN93 limit and the USN57 limits in these two ranges therefore would have been labelled decompression dives under current rules and as such were not captured for this analysis.

**Table 4**  
Air No-Decompression Dives Longer than Six Hours

Depth Range (fsw)	Duration (hours)				Total
	6-8	8-10	10-12	>12	
21-25	16	3	2	5	26
26-30	13*	7	6	6	32
Total	29	10	8	11	58

\*Two incidents reported (see Table 7 below)

**Table 5**  
Number of Dives Between USN93 and USN57 No-Decompression Limits

Depth Range (fsw)	≤ USN93	≤USN57	Between
21-25	29,291	29,325	34
26-30	42,791	43,455	664
31-35	26,970	28,621	1651
36-40	31,143	33,198	2055
41-45	--	--	--
46-50	12,976	13,302	366
51-55	--	--	--
Total			4770

Approximately 4,770 dives between 21 and 55 fsw would be converted from no-decompression dives to decompression dives in a 5 year period by adopting the USN93 limit in a single level dive format (Table 5). This represents 2.9% of the total dives conducted in this depth range. The word "approximately" is used because the dives falling between the USN93 and USN57 limits in the depth ranges of 41-45 and 51-55 fsw would actually be converted in the opposite direction, from decompression dives to no-decompression dives, making the total number of dives converted to decompression dives over the full depth range of 21-55 fsw less than 4,770. The precise reduction from 4,770 cannot be determined.

A total of 60 DCS/AGE incidents on open-water, air no-decompression dives were identified from the material provided by NSC. Of these, NSC considered 31 cases to represent DCS while 29 were considered AGE. Of the 31 DCS cases, 27 (87%) were reported by NSC as Type II DCS.

The NMRI panel of undersea medical officers felt that 36 of the 60 cases were definitely decompression-related (Definitely DCI), 7 were definitely not decompression-related (Definitely not DCI), and 17 were equivocal (*i.e.*, they may or may not have been decompression-related). For the cases labelled Definitely not DCI, symptoms were already present during the bottom phase of the dive or the diver failed to show any response to recompression therapy. Of those cases labelled Definitely DCI by the panel, 18 were felt to be DCS, 5 to be AGE, and 13 to be either DCS or AGE. After eliminating 7 cases considered Definitely Not DCI and 5 cases where both NMRI and NSC agreed on the diagnosis of AGE, 48 cases remained for analysis. One of the 7 cases eliminated as definitely not DCI had a bottom time longer than the USN93 limit (265 min at 28 fsw). The remaining 6 definitely not DCI cases and the 5 AGE cases all had bottom times shorter than the USN93 limit.

There was generally very good agreement between the depth/bottom time information provided on the incident report and the information contained in the dive database for the causative dive. There were some instances, however, where there were discrepancies. In one instance, the dive was reported as 90 minutes; the incident report indicated 91 minutes. In another instance, the dive record and the incident report numerical data both indicated a depth of 22 fsw, but the incident report narrative indicated a depth of 29 fsw. In a third instance, the dive record and incident report numerical data indicated a bottom time of 52 minutes, but the incident report narrative indicated 51 minutes. In a fourth instance, the dive record and

incident report numerical data indicated a depth of 26 fsw, while the incident report narrative indicated a depth of 30 fsw. Since there was agreement between the dive record and the incident report numerical data in the latter three instances, these values were used in the analysis. In the first instance, the 90-minute bottom time from the dive record was used.

Table 6 shows the distribution of incidents by bottom time within each depth range. Cases indicated by bold print lie beyond the USN93 limit. The shortest bottom time for a case was 13 minutes, the longest was 397 minutes. Within each depth range, cases appeared across the range of bottom times, with no evidence of clustering near the no-decompression limits.

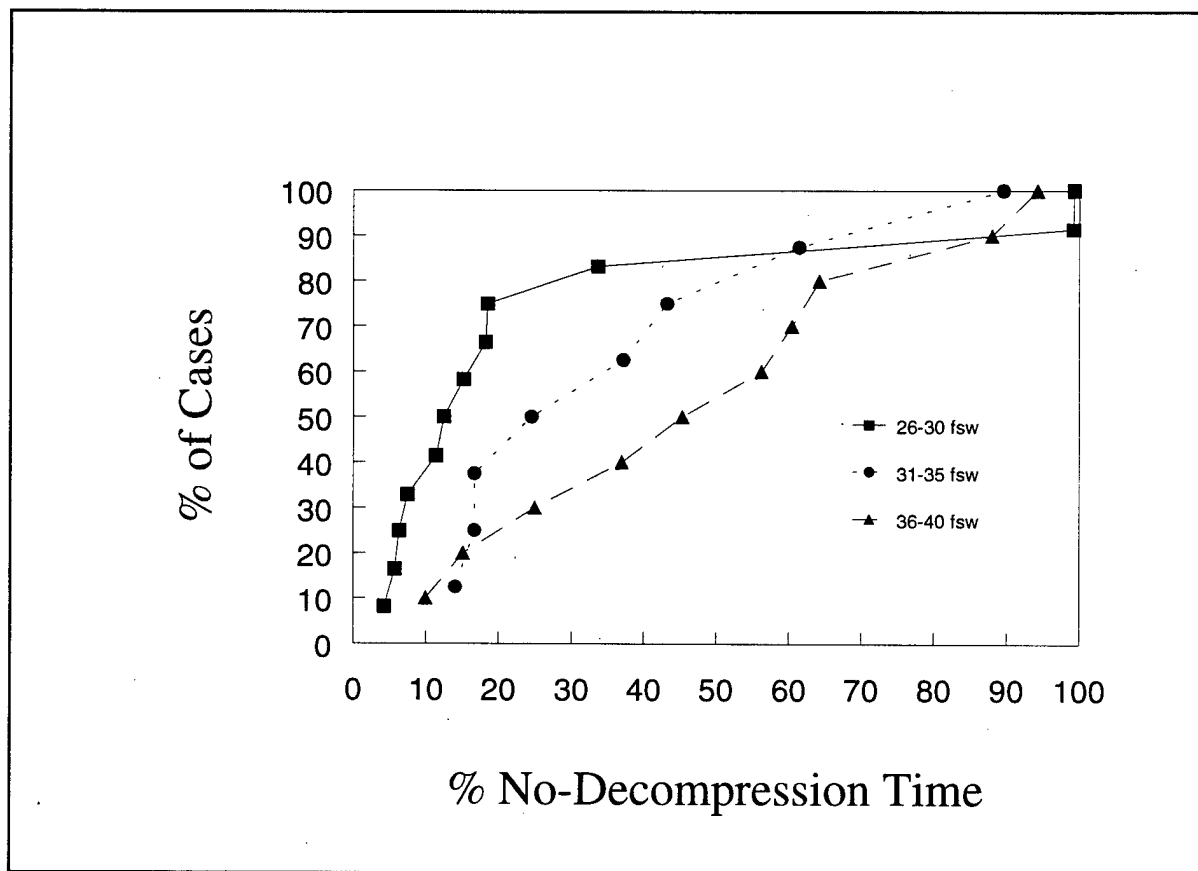
**Table 6**  
Distribution of Incidents by Bottom Time

Depth Range (fsw)	Bottom Time (min)
21-25	29,40,40,44,44,63,90,140
26-30	17,22,25,30,45,50,61,73,74,135, <b>397,397</b>
31-35	43,52,52,76,115,143, <b>191,278</b>
36-40	20,30,50,74,91,113,121,134, <b>176,189</b>
41-45	15,46,97
46-50	40,52,52,57
51-55	13,46,58

Figure 4 shows the percentage of total cases observed in the 26-30, 31-35, and 36-40 fsw depth ranges as a function of the bottom time expressed as percentage of the USN57 no-decompression limit. These are the depth ranges where implementation of the USN93 limit would have the greatest impact (see Table 5). For purposes of this analysis the USN57 no-decompression limit at 26-30 fsw was considered to be 400 minutes; in fact, it is infinite. For all three depth ranges, 70% or more of the cases are observed in the first 60% of the no-decompression time. For the 26-30 fsw range, nearly 80% of the cases are observed in the first 20% of the no-decompression time. (Note: This result would be even more striking if a no-decompression limit greater than 400 min had been selected for this depth range.) The

unexpectedly large number of cases at bottom times well short of the no-decompression limit is a reflection of the very large number of dives performed at these short times (see also the discussion below).

Six of the 48 cases (12.5%) occurred at bottom times between the USN93 limit and the USN57 limit. Table 7 summarizes the essential features of these cases. Appendix B gives greater detail. Three of the cases were from ship husbandry operations; three from special-warfare operations. All but one case demonstrated some form of neurological involvement. The NSC labelled two of the cases AGE, the remaining four DCS. The NMRI review panel felt one of the cases labelled AGE by NSC was in fact DCS; the other case labelled AGE by NSC was considered equivocal (*i.e.*, could have represented either DCS, AGE, or was not-decompression related). The first two cases occurred on the same dive.



**Figure 4.** Percentage of Cases Observed as a Function of the Fraction of USN57 No-Decompression Time. Most of the reported cases are observed well before the no-decompression limit is neared.

**Table 7**  
Cases Occurring Beyond the USN93 No-Decompression Limit

Dive (fsw/min)	Purpose	Symptoms	Diagnosis	
			NSC	NMRI
30/397	SW/SDV	Neuropsychiatric	DCS TYPE 2	EQV
30/397	SW/SDV	Numbness	DCS TYPE 2	DCS
33/278	SW/DDS	Back Pain	DCS TYPE 1	DCS
34/191	SH	Hearing Loss	AGE	EQV
37/176	SH	Pain/Weakness	AGE	DCS
40/189	SH	Pain/Numbness	DCS TYPE 2	DCS

SW-special warfare; SDV-swimmer diver vehicle; DDS-dry deck shelter;  
EQV-equivocal case, may or may not have been decompression-related.

Table 8 shows the DCS rate (cases/1000 dives) by depth interval without regard to bottom time. The rate is remarkably constant, ranging between 0.26 and 0.30 cases/1000 dives (2.6-3.0 cases/10,000 dives) across the entire range of 21 to 50 fsw. Only between 51 and 55 fsw does the rate increase to 0.73 cases/1000 dives.

**Table 8**  
DCS Rate as a Function of Depth Range

Depth Range (fsw)	Bottom Time (min)	Total Dives (#)	Total Cases (#)	Rate (cases/1000)
21-25	0-INF	29,325	8	0.27
26-30	0-INF	43,455	12	0.28
31-35	0-310	28,621	8	0.28
36-40	0-200	33,198	10	0.30
41-45	0-100	11,415	3	0.26
46-50	0-100	13,302	4	0.30
51-55	0-60	4,084	3	0.73
Total		163,400	48	0.29

Table 9 shows the DCS rate further segregated into quartiles of USN57 no-decompression time. At 21-30 fsw, where the USN57 limit is infinite, four quartiles of 100 minutes each were arbitrarily chosen, allowing the analysis to cover 400 minutes of bottom time and to encompass all of the observed cases of DCS. This process excluded 43 dives beyond the 400-minute mark from the analysis.

Overall, the quartile analysis shows a steadily increasing DCS rate from quartile to quartile, ranging from 0.22 cases/1000 dives in the first quartile to 1.28 cases/1000 dives in the fourth quartile. The DCS rate in the fourth quartile is 2.2 times the rate in the 3rd quartile and 5.8 times the rate in the first quartile.

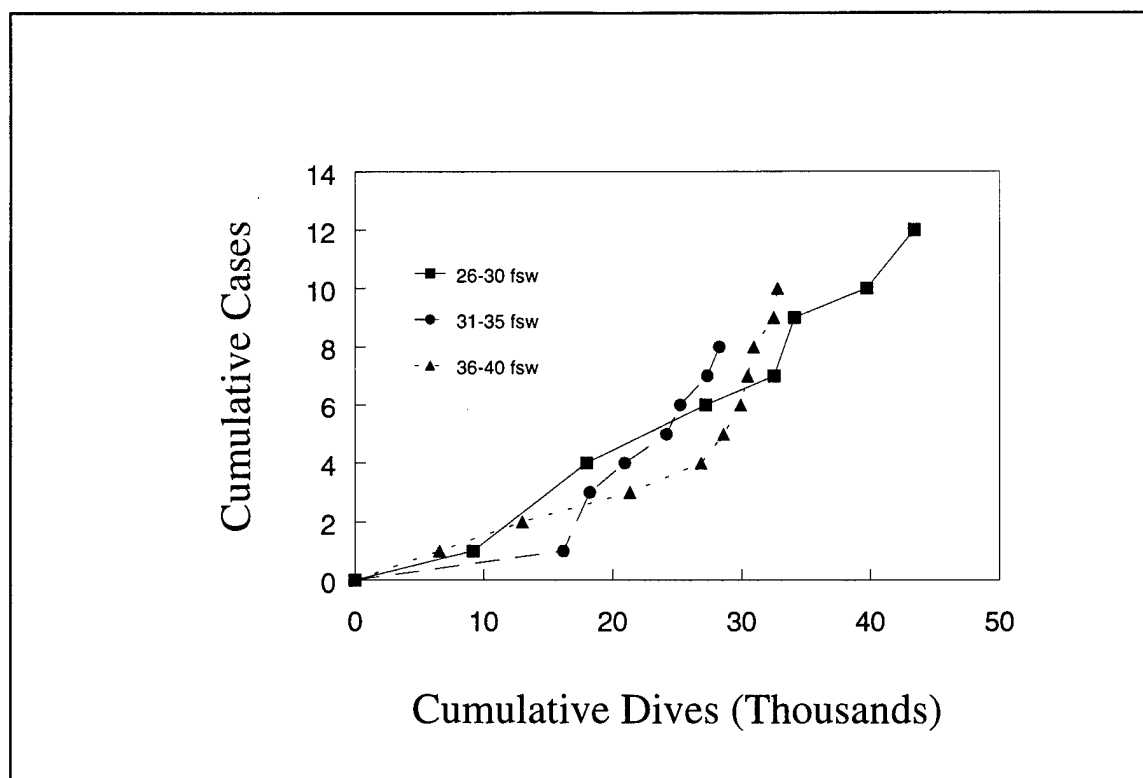
Figure 5 plots the cumulative number of DCS cases at 26-30, 31-35, and 36-40 fsw as a function of the cumulative number of dives undertaken beginning at a bottom time of 1-10 minutes and then proceeding to progressively longer bottom times. If the DCS rate was a constant value independent of bottom time, these plots would be expected to be straight lines with a y-intercept of zero and a slope equal to the DCS rate. At each depth, the curves bow upward indicating a rising DCS rate with increasing bottom time. The information plotted in Figure 5 is from Appendix A and Table 6.

Table 10 shows the DCS rate within each depth range when the dives are segregated into those equal to or shorter than the USN93 limit and those longer than the USN93 limit. The latter are the dives that would be converted to decompression dives by adopting the USN93 limit. The depth ranges 41-45 and 51-55 fsw are not shown since the USN93 limit exceeds the USN57 limit in these ranges. For dives equal to or shorter than the USN93 limit, the mean DCS rate is 0.26 cases/1000 dives (range 0.22-0.31). Longer than the USN93 limit, the mean DCS rate is 1.26 cases/1000 dives (range 0-3.01), a 4.8-fold increase over those dives equal to or shorter than the limit.

**Table 9**

**DCS Rate as a Function of Quartile of No-Decompression Time**

Depth Range (fsw)	Bottom Time (min)	Total Dives (#)	Total Cases (#)	Rate (#/1000)
21-25	0-100	24,584	7	0.28
	101-200	3,867	1	0.26
	201-300	775	0	0.00
	301-400	80	0	0.00
26-30	0-100	36,641	9	0.25
	101-200	5,370	1	0.19
	201-300	1,330	0	0.00
	301-400	90	2	22.22
31-35	0-78	20,701	4	0.19
	79-155	5,175	2	0.39
	156-233	1,981	1	0.50
	234-310	764	1	1.31
36-40	0-50	21,300	3	0.14
	51-100	7,374	2	0.27
	101-150	2,704	3	1.11
	151-200	1,820	2	1.10
41-45	0-25	3,826	1	0.26
	26-50	4,646	1	0.22
	51-75	1,743	0	0.00
	76-100	1,200	1	0.83
46-50	0-25	3,862	0	0.00
	26-50	5,679	1	0.18
	51-75	2,347	3	1.28
	76-100	1,414	0	0.00
51-55	0-15	651	1	1.54
	16-30	1,394	0	0.00
	31-45	1,139	0	0.00
	46-60	900	2	2.22
Summary	1 <sup>st</sup> Quartile	111,565	25	0.22
	2 <sup>nd</sup> Quartile	33,505	8	0.24
	3 <sup>rd</sup> Quartile	12,019	7	0.58
	4 <sup>th</sup> Quartile	6,268	8	1.28
TOTAL		163,357	48	0.29



**Figure 5.** Cumulative Number of Cases versus Cumulative Number of Dives Undertaken. At the three depths shown, the curves tend to bow upward suggesting the DCS rate is rising with increasing bottom time.

**Table 10**  
DCS Rate for Dives Shorter or Longer than the USN93 Limit

Depth Range (fsw)	Shorter than USN93 Limit			Longer than USN93 Limit		
	Dives (#)	Cases (#)	Rate (#/1000)	Dives (#)	Cases (#)	Rate (#/1000)
21-25	29,291	8	0.27	34	0	0.00
26-30	42,791	10	0.23	664	2	3.01
31-35	26,970	6	0.22	1651	2	1.21
36-40	31,143	8	0.26	2055	2	0.97
41-45	11,415	3	0.26	--	-	--
46-50	12,936	4	0.31	366	0	0.00
51-55	4,084	3	0.73	--	-	--
Total	158,630	42	0.26	4770	6	1.26



## DISCUSSION

The epidemiologic data that the NSC collects on U.S. military diving operations is among the best in the world today. Nevertheless, we found that these data sets were not error-free. Approximately 2% of the diving records we examined had to be excluded from the study because they represented duplicate entries, had listed bottom times in excess of the air no-decompression limits, or listed a breathing apparatus inconsistent with air diving (*e.g.*, LAR V). We observed that reported maximum depth was usually rounded up to the next even increment of 5 or 10 fsw. Reported bottom time appeared to be rounded up as well.

Incident reports occasionally contained conflicting depth and time information. By far the more limiting feature of the incident report, however, was the quantity and quality of the information contained in the narrative section. These narratives, containing 100-200 words, provided scant information on the clinical presentation of the cases (see Appendix B for examples). The information was so brief that the panel of undersea medical officers in seven cases could not conclude whether the case was related to decompression or not. The narratives appeared to be written largely by non-medical personnel, and in the cases where two divers from the same dive were treated, the narratives were nearly identical for both divers (see Appendix B). A different categorization may have been reached by the panel if full narrative summaries of the incidents written by the attending physician or corpsman had been available for examination.

Eighty-seven percent of the cases reported to NSC as DCS were labelled Type II. The prominence of Type II symptoms was surprising given previous reports of the experimental and operational experience of professional divers (13,14,15) in which Type I symptoms are the dominant manifestation of DCS. The finding of a high prevalence of Type II symptoms is consistent, however, with recently reported observations in recreational divers (15,16) for whom, as a class, medical monitoring and incident reporting are highly variable.

For all depth ranges, the incidents of definite and possible DCS were distributed broadly over the range of bottom times up to the USN57 no-decompression limit. The cases were not clustered near the no-decompression limit as might be expected. In fact, most cases were observed in the first quartile of the no-decompression time, and can be attributed to the

high frequency of diving at these short bottom times (see Figure 1 and Table 9), not to a higher risk level. Experience has shown that DCS can occur after almost any hyperbaric exposure, even very short and shallow ones. Although the probability of DCS on these dives is very low, the sheer number of dives makes the observance of some cases inevitable.

The data show a clear pattern of increasing risk of DCS with increasing bottom time. The DCS rate for the 4th quartile of no-decompression time is 2.2 times the 3rd quartile rate and nearly 6 times the 1st quartile rate. The DCS rate for dives longer than the USN93 limit is 4.8 times the rate for dives shorter than the limit.

Despite the pattern of increasing risk with increasing bottom time, the absolute risk of DCS during no-decompression diving as currently practiced is quite low. For dives falling between the USN93 limit and the USN57 limit, the mean DCS rate is only 1.26 cases/1000 dives. The highest rate observed in this interval is 3.01 cases/1000 dives.

It would have been highly desirable to make point estimates of the DCS rate at the USN93 and USN57 limit times for each depth range rather than estimates for the preceding interval. The DCS rate for dives conducted at the longer USN57 limit, for example, will be clearly greater than the rate for all the dives between the USN93 and the USN57 limit. Unfortunately, the low number of reported cases would not sustain such an analysis.

### **IMPACT OF ADOPTING THE USN93 NO-DECOMPRESSION LIMITS**

The foregoing analysis allows assessment of the likely operational impact of adopting the USN93 no-decompression limits. If the new limits were adopted in the context of single-level dive tables similar to USN57 and the pattern of diving in the Fleet remained unchanged, approximately 954 dives per year (4,770 dives/5 years, see Table 5) would be converted from no-decompression dives to dives requiring decompression. This number is a slight overestimate since a small number of dives in the 41-45 and 51-55 fsw range now requiring decompression would be converted to no-decompression dives. The 954 dives would add approximately 419 hours of decompression time to operations annually assuming that these dives were all square dives to the maximum depth and bottom time indicated in the NSC data and that decompression was computed using the new USN93 tables. This is an average of 26.3 minutes of decompression per dive for this subset of dives.

The institution of decompression for the 954 dives between the USN93 and USN57 limits would reduce the DCS risk below the current risk with no-decompression, but would not eliminate risk altogether. The decompression tables themselves are associated with a finite level of risk. Using the USN93 algorithm, the risk of performing these 954 dives with and without decompression was computed. For this calculation, the 4,770 dives over the USN93 limit for the five-year period were aggregated into a spreadsheet in depth intervals of 5 fsw (*e.g.*, 26 to 30 fsw) and time intervals of 10 minutes (*e.g.*, 251 to 260 minutes). For all dives in the spreadsheet cell, the depth for the calculation was taken as the upper limit of the cell (*e.g.*, 30 fsw for 26-30 fsw) and the bottom time was taken as the mid point of the cell (*e.g.*, 255 min for 251-260 min). For the 4,770 dives in question, the DCS risk with decompression was estimated by the algorithm to be 85% of the risk of performing them without decompression. In other words, the DCS risk is approximately 15% lower with USN93 decompression than without.

Six cases of DCS were observed in 5 years on the 4770 dives performed over the USN93 limit. This gives a baseline risk of 1.26 cases/1000 dives when these dives are performed without decompression. Based on the analysis outlined above, the risk on these dives with the institution of decompression would be expected to fall to 1.07 cases/1000 dives ( $1.26 \times 0.85$ ). For the 954 dives over the USN93 limit annually, this would result in a rate of 1.02 cases/year with decompression vice 1.20 cases/year without decompression, or the avoidance of 0.18 case/year. This number is a slight overestimate of the benefit since the dives in the 41-45 fsw and 51-55 fsw ranges converted from decompression dives to no-decompression dives would add back in a small risk.

Thus, the best estimate of the cost/benefit of adopting the USN93 limits in the context of single level dive tables is the addition of approximately 419 hours of decompression time annually to operations for the avoidance of 0.18 cases of DCS.

## CONCLUSIONS

1. The overall DCS rate for shallow water, air, no-stop diving in the U.S. Navy is very low, approximately 0.29 cases/1000 dives. This overall rate remains nearly constant over the depth range of 21-50 fsw.
2. The observed probability of DCS with shallow no-decompression diving increases with increasing bottom time. The DCS rate during the 4th quartile of USN57 no-decompression time (1.28 cases/1000 dives) is approximately six times the rate in the 1st quartile (0.22 cases/1000 dives). For bottom times longer than the proposed USN93 limit, the DCS rate is 1.26 cases/1000 dives, which is substantially greater than the DCS rate of 0.26 cases/1000 dives for dives shorter than the limit, but still quite low in absolute terms.
3. There is no evidence that divers are currently pushing the no-decompression limits in shallow water. In fact, the vast majority of dives are conducted at less than 25% of the current no-decompression limits for the depth ranges studied here.
4. The proportion of DCS cases reported as Type II in shallow no-stop diving is significantly higher than has been previously reported in military divers.
5. If the USN93 limits were adopted and used in the context of single-level diving tables, approximately 0.18 cases of DCS would be avoided per year at a cost of approximately 419 hours of additional decompression time.
6. These data do not support shortening the USN57 no-decompression limits in shallow water.

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**APPENDIX A**

**FREQUENCY OF SHALLOW AIR NO-DECOMPRESSION DIVING**

**1990 - 1994**

# Table A1

Distribution of Dives by Depth and Bottom Time

## All Dives

### Scuba

B.T. -->	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Total	# Buys	# No-DL	
21-25	1468	2684	3648	2261	1391	1049	682	442	405	280	224	273	182	166	134	96	58	60	46	47	34	22	19	34	5	18	15	8	13	4	2	8	3	2	0	3	18228	14	18228
26-30	1617	3659	5018	2916	2085	1541	966	674	613	347	319	332	250	200	142	114	112	136	60	52	76	29	30	54	15	37	19	8	7	10	6	9	7	1	0	13031	22	13031	
31-35	815	2339	2840	1971	1339	1082	589	451	317	187	156	172	129	85	76	70	64	43	33	30	19	27	13	24	6	0	0	0	0	0	0	0	0	0	0	0	5941	22	5941
36-40	1072	3352	4175	3180	2013	1563	839	562	387	245	197	173	124	103	88	45	61	69	43	34	60	3	6	2	5	0	0	0	0	0	0	0	0	0	0	0	2948	15	2948
41-45	419	1192	1180	1025	843	304	207	190	120	70	0	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5941	22	5941
46-50	591	1266	1983	1813	1387	968	444	314	231	264	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2948	15	2948
51-55	218	684	736	513	344	378	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2948	15	2948
Total	6220	15148	20318	14154	9784	7220	3627	2650	2208	1471	913	690	695	442	326	295	335	175	194	143	78	61	130	52	76	55	49	37	38	19	13	18	12	2	6	86673	113	86673	

Cumulative Sums: Scuba

21-25	1468	4372	8220	10481	11872	12921	13603	14045	14450	14730	14854	15227	15409	15575	15709	15905	15863	15991	16038	16072	16004	16113	16147	16152	16170	16185	16193	16206	16210	16212	16220	16223	16225	16226	16228		
26-30	1617	5276	10294	13210	15296	16345	17023	17478	17889	18246	18559	18837	19087	19319	19532	19735	19687	19816	19953	20087	20218	20348	20477	20605	20732	20858	20983	21107	21229	21347	21458	21569	21678	21785	21890		
31-35	815	2483	3398	4323	5266	6215	7170	8133	9104	10083	11070	12065	13067	14076	15092	16115	16173	16231	16289	16346	16402	16457	16511	16564	16616	16667	16717	16766	16814	16861	16907	16953	16998	17043	17087	17130	
36-40	1072	2844	4832	6803	8756	10699	12632	14555	16468	18370	20261	22140	24007	25862	27705	29536	29303	29070	28836	28601	28365	28128	27890	27651	27411	27170	26928	26685	26441	26196	25950	25703	25455	25206	24956	24705	
41-45	419	1611	2830	4049	5268	6487	7706	8925	10144	11363	12582	13801	15020	16239	17458	18677	18735	18793	18851	18909	18967	19024	19081	19138	19195	19252	19309	19366	19423	19479	19536	19592	19648	19704	19760	19816	19872
46-50	591	1857	3440	5033	6626	8219	9812	11405	13000	14595	16190	17785	19380	20975	22570	24165	24223	24281	24339	24397	24454	24511	24568	24625	24682	24739	24796	24853	24910	24967	25024	25081	25138	25195	25252	25309	25366
51-55	218	664	1420	2063	2577	2956	3256	3556	3856	4156	4456	4756	5056	5356	5656	5956	5968	5980	5992	6004	6016	6028	6040	6052	6064	6076	6088	6100	6112	6124	6136	6148	6160	6172	6184	6196	6208
Total	6220	15148	20318	24462	28606	32750	36894	41038	45182	49326	53470	57614	61758	65902	70046	74190	74258	74326	74394	74462	74530	74598	74666	74734	74802	74870	74938	75006	75074	75142	75210	75278	75346	75414	75482	75550	75618

Surface Supplied

B.T. -->	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Total	# Buys	# No-DL
21-25	1500	2081	2908	3908	5098	6468	8018	9748	11658	13748	15918	18168	20498	22908	25398	27968	29718	30648	30738	30828	30918	31008	31098	31188	31278	31368	31458	31548	31638	31728	31818	31908	31998	32088	32178	32268	32358	
26-30	1264	2648	3708	4588	5388	6188	6988	7788	8588	9388	10188	10988	11788	12588	13388	14188	14988	15788	16588	17388	18188	18988	19788	20588	21388	22188	22988	23788	24588	25388	26188	26988	27788	28588	29388	30188	30988	
31-35	671	1435	2043	2532	3021	3510	4000	4489	4978	5467	5956	6445	6934	7423	7912	8401	8890	9379	9868	10357	10846	11335	11824	12313	12802	13291	13780	14269	14758	15247	15736	16225	16714	17203	17692	18181		
36-40	579	1555	2177	2800	3422	4044	4666	5288	5910	6532	7154	7776	8398	9020	9642	10264	10886	11508	12130	12752	13374	13996	14618	15240	15862	16484	17106	17728	18350	18972	19594	20216	20838	21460	22082	22704		
41-45	328	689	845	1001	1157	1313	1469	1625	1781	1937	2093	2249	2405	2561	2717	2873	3029	3185	3341	3497	3653	3809	3965	4121	4277	4433	4589	4745	4901	5057	5213	5369	5525	5681	5837	5993		
46-50	154	328	492	656	820	984	1148	1312	1476	1640	1804	1968	2132	2296	2460	2624	2788	2952	3116	3280	3444	3608	3772	3936	4100	4264	4428	4592	4756	4920	5084	5248	5412	5576	5740	5904		
51-55	64	138	212	286	360	434	508	582	656	730	804	878	952	1026	1100	1174	1248	1322	1396	1470	1544	1618	1692	1766	1840	1914	1988	2062	2136	2210	2284	2358	2432	2506	2580	2654		
Total	6220	15148	20318	24462	28606	32750	36894	41038	45182	49326	53470	57614	61758	65902	70046	74190	74258	74326	74394	74462	74530	74598	74666	74734	74802	74870	74938	75006	75074	75142	75210	75278	75346	75414	75482	75550	75618	

### Cumulative Sums: Scuba

Surface Supplied		B.T. →		0-10		11-20		21-30		31-40		41-50		51-60		61-70		71-80		81-90		91-100		100-110		111-120		121-130		131-140		141-150		151-160		161-170		171-180		181-190		191-200		201-210		211-220		221-230		231-240		241-250		251-260		261-270		271-280		281-290		291-300		301-310		311-320		321-330		331-340		341-350		351-360		Total		# Bags		Mod-U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
21-25	1468	4372	8220	10461	11872	12921	13803	14045	14450	14730	14854	15227	15409	15535	15709	15843	15991	16038	16072	16094	16113	16147	16152	16170	16185	16190	16196	16206	16210	16212	16220	16223	16225	16225	16225	16225	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228	16228

### Cumulative Sums: Surface Supplied

21-25	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
26-30	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
31-35	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
36-40	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
41-45	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
46-50	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
51-55	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
Total	4096	8554	11838	15098	18298	21498	24698	27898	31098	34298	37498	40698	43898	47098	50298	53498	56698	59898	63098	66298	69498	72698	75898	79098	82298	85498	88698	91898	95098	98298	101498	104698	107898	111098	114298	117498	120698	

### Total

21-25	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
26-30	821	1500	2081	2598	3068	3498	3888	4238	4548	4818	5058	5268	5448	5598	5728	5838	5938	6028	6108	6178	6238	6288	6328	6358	6378	6388	6398	6408	6418	6428	6438	6448	6458	6468	6478	6488	6498	6508
31-35	1496	3764	4883	5503	6123	6743	7363	7983	8603	9223	9843	10463	11083	11703	12323	12943	13563	14183	14803	15423	16043	16663	17283	17903	18523	19143	19763	20383	21003	21623	22243	22863	23483	24103	24723	25343	25963	
36-40	1496	3764	4883	5503	6123	6743	7363	7983	8603	9223	9843	10463	11083	11703	12323	12943	13563	14183	14803	15423	16043	16663	17283	17903	18523	19143	19763	20383	21003	21623	22243	22863	23483	24103	24723	25343	25963	
41-45	1496	3764	4883	5503	6123	6743	7363	7983	8603	9223	9843	10463	11083	11703	12323	12943	13563	14183	14803	15423	16043	16663	17283	17903	18523	19143	19763	20383	21003	21623	22243	22863	23483	24103	24723	25343	25963	
46-50	870	1614	2655	3362	3850	4338	4826	5314	5802	6290	6778	7266	7754	8242	8730	9218	9706	10194	10682	11170	11658	12146	12634	13122	13610	14098	14586	15074	15562	16050	16538	17026	17514	18002	18490	18978		
51-55	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
56-60	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
61-65	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
66-70	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
71-75	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
76-80	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
81-85	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
86-90	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
91-95	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
96-100	352	645	1048	1458	1869	2279	2689	3099	3509	3919	4329	4739	5149	5559	5969	6379	6789	7199	7609	8019	8429	8839	9249	9659	10069	10479	10889	11299	11709	12119	12529	12939	13349	13759	14169	14579		
B.T. >	2000	4304	5929	7357	8589	9664	10614	11474	12264	13004	13704	14384	15044	15694	16334	16964	17584	18194	18794	19384	19964	20534	21094	21644	22184	22714	23234	23754	24264	24764	25254	25734	26204	26664	27114	27554		
B.T. >=	2000	4304	5929	7357	8589	9664	10614	11474	12264	13004	13704	14384	15044	15694	16334	16964	17584	18194	18794	19384	19964	20534	21094	21644	22184	22714	23234	23754	24264	24764	25254	25734	26204	26664	27114	27554		
Totals	4096	8554	11838	15098	18298	21498	24698	27898	31098	34298	37498	40698	43898	47098	50298	53498	56698	59898	63098	66298	69498	72698	75898	79098	82298	85498	88698	91898	95098	98298	101498	104698	107898	111098	114298			

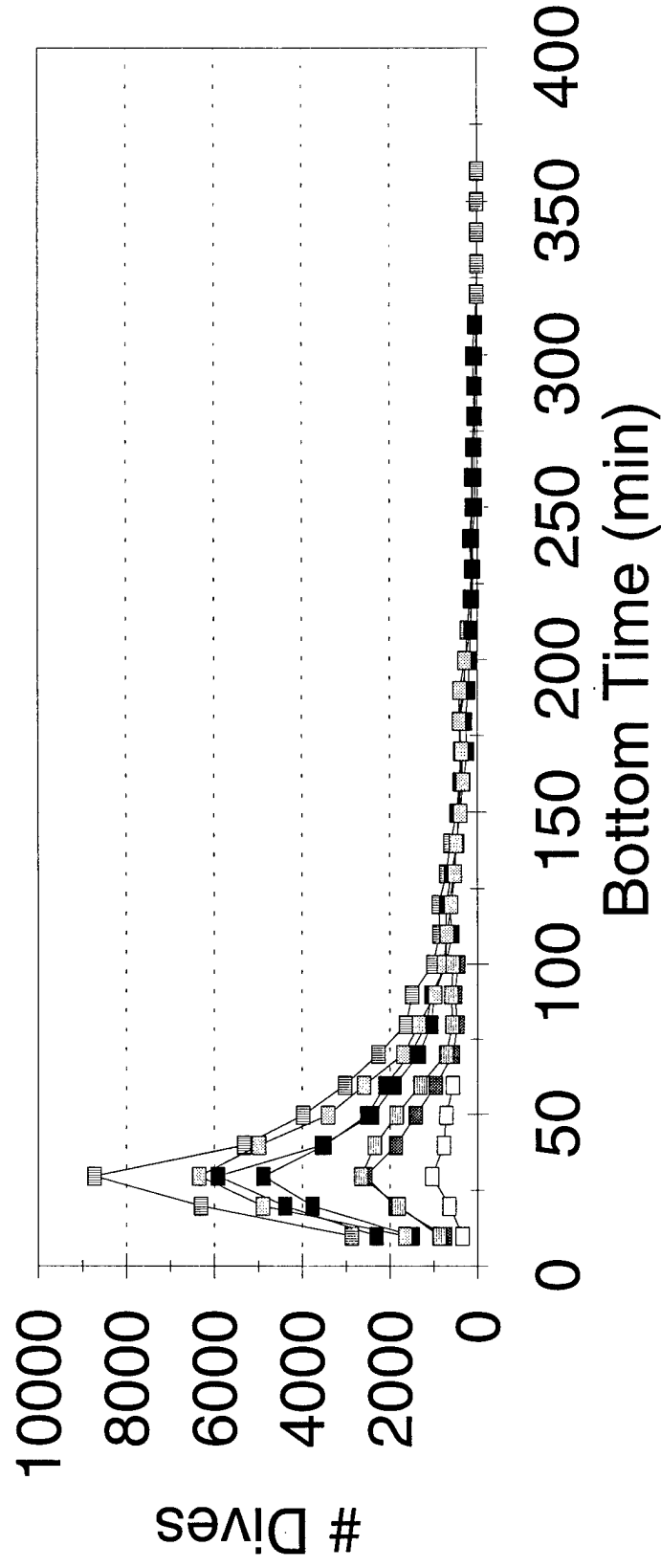
### Cumulative Sums: Total

21-25	2200	5629	12622	16179	18278	20465	21806	23869	25158	26591	28348	30484	32641	34817	37122	39545	42015	44546	47140	49798	52511	55279	58107	60996	63946	66957	69929	72962	75956	78999	82000	85051	88051	91051	94051	97051	100051	103051	106051	109051	112051	115051	118051	121051	124051	127051	130051	133051	136051	139051	142051	145051	148051	151051	154051	157051	160051	163051	166051	169051	172051	175051	178051	181051	184051	187051	190051	193051	196051	199051	202051	205051	208051	211051	214051	217051	220051	223051	226051	229051	232051	235051	238051	241051	244051	247051	250051	253051	256051	259051	262051	265051	268051	271051	274051	277051	280051	283051	286051	289051	292051	295051	298051	301051	304051	307051	310051	313051	316051	319051	322051	325051	328051	331051	334051	337051	340051	343051	346051	349051	352051	355051	358051	361051	364051	367051	370051	373051	376051	379051	382051	385051	388051	391051	394051	397051	400051	403051	406051	409051	412051	415051	418051	421051	424051	427051	430051	433051	436051	439051	442051	445051	448051	451051	454051	457051	460051	463051	466051	469051	472051	475051	478051	481051	484051	487051	490051	493051	496051	499051	502051	505051	508051	511051	514051	517051	520051	523051	526051	529051	532051	535051	538051	541051	544051	547051	550051	553051	556051	559051	562051	565051	568051	571051	574051	577051	580051	583051	586051	589051	592051	595051	598051	601051	604051	607051	610051	613051	616051	619051	622051	625051	628051	631051	634051	637051	640051	643051	646051	649051	652051	655051	658051	661051	664051	667051	670051	673051	676051	679051	682051	685051	688051	691051	694051	697051	700051	703051	706051	709051	712051	715051	718051	721051	724051	727051	730051	733051	736051	739051	742051	745051	748051	751051	754051	757051	760051	763051	766051	769051	772051	775051	778051	781051	784051	787051	790051	793051	796051	799051	802051	805051	808051	811051	814051	817051	820051	823051	826051	829051	832051	835051	838051	841051	844051	847051	850051	853051	856051	859051	862051	865051	868051	871051	874051	877051	880051	883051	886051	889051	892051	895051	898051	901051	904051	907051	910051	913051	916051	919051	922051	925051	928051	931051	934051	937051	940051	943051	946051	949051	952051	955051	958051	961051	964051	967051	970051	973051	976051	979051	982051	985051	988051	991051	994051	997051	1000000
26-30	2200	5629	12622	16179	18278	20465	21806	23869	25158	26591	28348	30484	32641	34817	37122	39545	42015	44546	47140	49798	52511	55279	58107	60996	63946	66957	69929	72962	75956	78999	82000	85051	88051	91051	94051	97051	100051	103051	106051	109051	112051	115051	118051	121051	124051	127051	130051	133051	136051	139051	142051	145051	148051	151051	154051	157051	160051	163051	166051	169051	172051	175051	178051	181051	184051	187051	190051	193051	196051	199051	202051	205051	208051	211051	214051	217051	220051	223051	226051	229051	232051	235051	238051	241051	244051	247051	250051	253051	256051	259051	262051	265051	268051	271051	274051	277051	280051	283051	286051	289051	292051	295051	298051	301051	304051	307051	310051	313051	316051	319051	322051	325051	328051	331051	334051	337051	340051	343051	346051	349051	352051	355051	358051	361051	364051	367051	370051	373051	376051	379051	382051	385051	388051	391051	394051	397051	400051	403051	406051	409051	412051	415051	418051	421051	424051	427051	430051	433051	436051	439051	442051	445051	448051	451051	454051	457051	460051	463051	466051	469051	472051	475051	478051	481051	484051	487051	490051	493051	496051	499051	502051	505051	508051	511051	514051	517051	520051	523051	526051	529051	532051	535051	538051	541051	544051	547051	550051	553051	556051	559051	562051	565051	568051	571051	574051	577051	580051	583051	586051	589051	592051	595051	598051	601051	604051	607051	610051	613051	616051	619051	622051	625051	628051	631051	634051	637051	640051	643051	646051	649051	652051	655051	658051	661051	664051	667051	670051	673051	676051	679051	682051	685051	688051	691051	694051	697051	700051	703051	706051	709051	712051	715051	718051	721051	724051	727051	730051	733051	736051	739051	742051	745051	748051	751051	754051	757051	760051	763051	766051	769051	772051	775051	778051	781051	784051	787051	790051	793051	796051	799051	802051	805051	808051	811051	814051	817051	820051	823051	826051	829051	832051	835051	838051	841051	844051	847051	850051	853051	856051	859051	862051	865051	868051	871051	874051	877051	880051	883051	886051	889051	892051	895051	898051	901051	904051	907051	910051	913051	916051	919051	922051	925051	928051	931051	934051	937051	940051	943051	946051	949051	952051	955051	958051	961051	964051	967051	970051	973051	976051	979051	982051	985051	988051	991051	994051	997051	1000000



# Figure A1

All Dives



■ 21 - 25 ■ 26 - 30 ■ 31 - 35 ■ 36 - 40  
■ 41 - 45 ■ 46 - 50 ■ 51 - 55

# Table A2

Distribution of Dives by Depth and Bottom Time

## Navy Dives

### Scuba

B.T. →	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	# Bayo No-D.L.	
21-25	1262	2275	2825	1602	924	748	480	337	303	219	196	233	160	136	105	85	52	70	46	42	33	22	14	25	5	11	15	8	13	4	2	7	3	2	0	3	12267	14
26-30	1339	2794	3900	2160	1464	1119	610	416	274	247	259	196	163	126	91	62	29	24	43	12	24	19	8	7	10	9	3	9	0	1	0	1	0	0	0	10526	39	
31-35	1355	2827	4027	2320	1584	1124	610	416	274	247	259	196	163	126	91	62	29	24	43	12	24	19	8	7	10	9	3	9	0	1	0	1	0	0	0	18141	14	
36-40	924	1602	2825	1602	924	748	480	337	303	219	196	233	160	136	105	85	52	70	46	42	33	22	14	25	5	11	15	8	13	4	2	7	3	2	0	3	18141	14
41-45	359	960	1406	1151	813	521	359	279	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	8877	15	
46-50	555	1068	1590	1427	1074	734	521	359	279	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	247	8877	103	
51-55	198	358	569	486	446	264	3	0	3	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2336	6	
Totals	5368	12145	15870	10863	7326	5446	2844	1793	1447	988	727	742	533	440	364	275	250	295	159	128	78	50	109	49	56	55	49	37	38	19	12	18	12	2	6	68533		

### Cumulative Sums: Scuba

21-25	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	
26-30	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	
31-35	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	
36-40	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	
41-45	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	
46-50	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	
51-55	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	
Totals	1262	3537	6362	7964	8888	9636	10116	10453	10756	10975	11171	11404	11564	11700	11805	11890	11942	12012	12058	12100	12133	12155	12169	12194	12206	12219	12233	12246	12250	12252	12259	12262	12264	12264	12267	

### Surface Supplied

B.T. →	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	# Bayo No-D.L.
21-25	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	8
26-30	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	8
31-35	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	8
36-40	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	8
41-45	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	8
46-50	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	8
51-55	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	8
Totals	702	1191	1577	919	732	596	453	442	387	310	250	203	256	244	228	190	158	169	132	116	102	83	66	79	33	44	39	37	29	33	30	14	1	0	1	3	9648	48

### Cumulative Sums: Surface Supplied

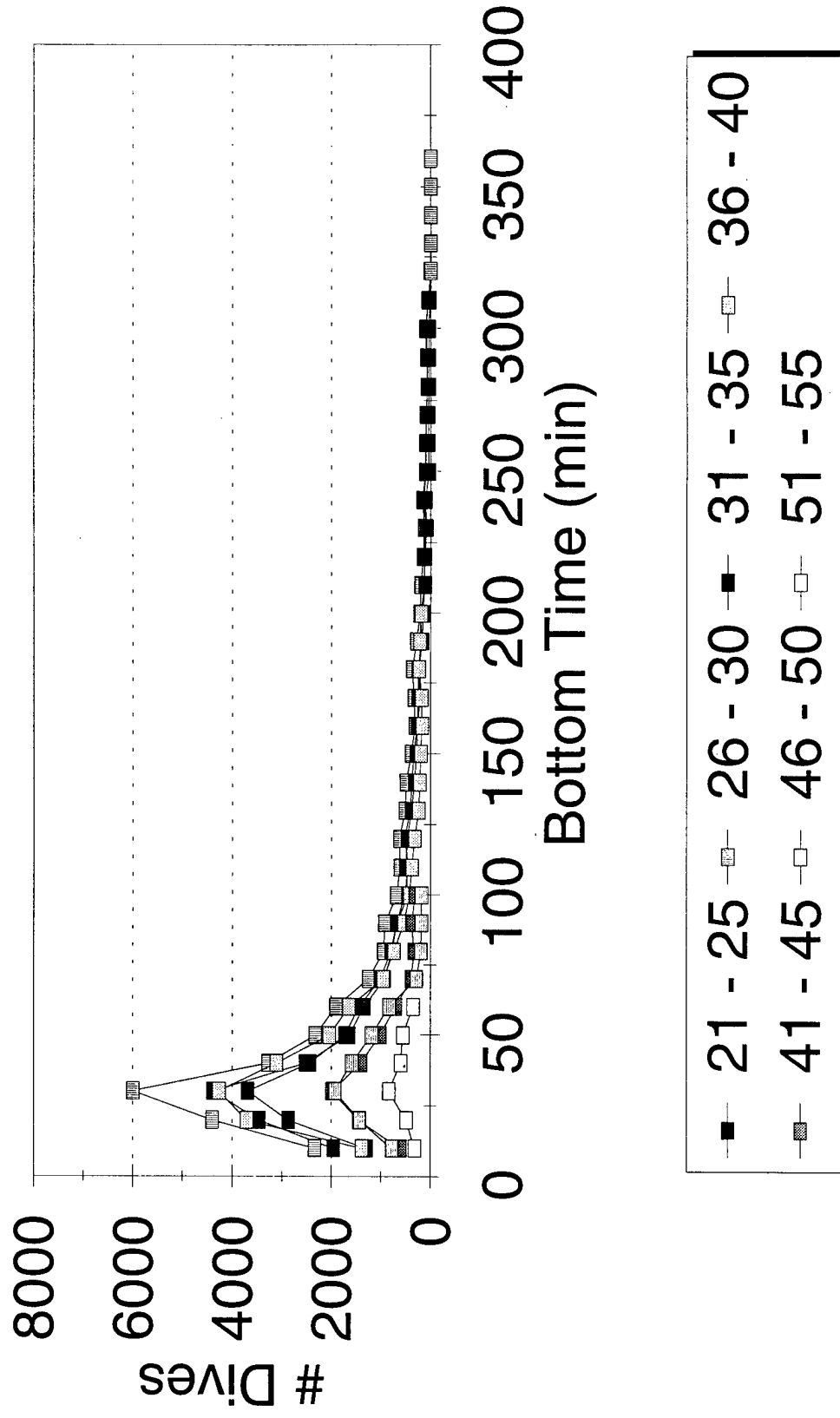
21-25	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	
26-30	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	
31-35	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	
36-40	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	
41-45	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	
46-50	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	
51-55	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	
Totals	702	1893	3470	4389	5121	5717	6170	6461	6699	6909	7099	7259	7382	7476	7540	7584	7618	7652	7686	7720	7754	7788	7822	7856	7890	7924	7958	7992	8026	8060	8094	8128	8162	8196	8230	8264	8298	

### Total

B.T. →	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	No-D.L.	
21-25	1964	3466	4402	2531	1656	1344	833	779	690	529	416	506	618	529	323	210	239	172	158	135	160	104	38	55	45	42	34	21	4	2	0	0	0	0	0	6	22215	20	
26-30	2342	2873	3692	3280	2336	1511	1250	948	681	529	416	506	618	529	323	210	239	172	158	135	160	104	38	55	45	42	34	21	4	2	0	0	0	0	0	6	22215	20	
31-35	2907	3692	2449	2735	1448	681	462	505	468	394	321	292	262	253	246	177	182	236	224	194	6	10	2	7	6	0	0	0	0	0	0	0	0	0	0	0	5	20734	20
36-40	2506	1646	1655	1448	748	375	327	245	223	194	177	182	236	224	194	6	10	2	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21287	48	
41-45	1718	1318	1046	748	505	468	394	321	292	262	253	246	177	182	236	224	194	6	10	2	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21287	48	
46-50	1451	1205	1046	748	505	468	394	321	292	262	253	246	177	182	236	224	194	6	10	2	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86439	23	
51-55	790	1437	1537	1591	1199	841	294	199	187	184	2	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86439	23	
56-60	8634	499	846	610	560	365	4	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3218	18	
61-65	14977	10559	8264	4841	3799	3410	2604	1568	1965	1590	1424	1210	1033	978	910	874	793	465	426	303	410	267	265	260	290	296	245	148	0	0	0	0	0	0	0	0	1510888	15	
66-70	23164	17654	13732	9954	7323	5454	4043	3043	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
71-75	17654	13732	9954	7323	5454	4043	3043	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
76-80	9954	7323	5454	4043	3043	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
81-85	7323	5454	4043	3043	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
86-90	5454	4043	3043	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
91-95	4043	3043	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
96-100	3043	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
101-105	2243	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
106-110	1743	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
111-115	1343	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
116-120	1043	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
121-125	843	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
126-130	643	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
131-135	443	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
136-140	243	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
141-145	143	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
146-150	93	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1510888	15	
151-155	43	33	23	13	3	3	3	3	3	3	3	3	3	3	3	3	3																						

# Figure A2

## Navy Dives



# Table A3

Distribution of Dives by Depth and Bottom Time

## Civilian Dives

### Scuba

B.T. →	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	# Bayc	No-D Li
21-25	51	148	192	155	147	90	108	66	56	45	23	34	19	23	16	6	4	8	2	1	1	0	5	8	9	3	13	0	0	0	0	0	0	0	0	0	1213	0	
26-30	26	30	103	320	320	266	279	212	156	54	58	65	60	34	13	23	13	15	9	9	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2153	0
31-35	28	147	175	142	134	160	101	86	90	45	19	49	30	14	7	12	14	9	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1276	0
36-40	40	27	142	345	345	271	198	187	133	102	62	48	37	43	23	4	9	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	732	1
41-45	27	115	128	106	108	108	80	58	40	28	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1608	8	
46-50	14	91	151	187	197	132	200	174	211	203	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	305	0
51-55	10	64	48	45	62	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10100	9	
Totals	297	1143	1434	1290	1239	1062	933	711	643	450	156	185	153	104	59	45	40	37	24	31	15	0	11	18	3	16	0	0	0	0	0	0	0	0	0	0	0	305	9

### Cumulative Sums: Scuba

21-25	51	199	391	546	693	783	891	957	1013	1058	1081	1115	1134	1157	1173	1179	1183	1191	1195	1195	1200	1209	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	1212	121
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### Surface Supplied

B.T. →	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	No-D Bayc	
21-25	88	219	341	330	261	228	190	170	184	144	97	96	86	68	45	30	20	28	23	12	9	2	3	13	1	4	3	2	0	0	0	0	0	0	0	2719	0	
26-30	207	691	1221	1221	995	680	641	429	359	255	180	165	130	83	67	63	44	34	29	29	14	10	6	7	3	1	5	3	2	0	0	0	0	0	0	0	4022	0
31-35	83	380	577	638	476	397	400	274	271	208	182	165	170	128	136	99	110	132	102	64	26	9	14	9	6	13	3	2	0	0	0	0	0	0	0	0	5109	0
36-40	57	171	280	196	151	109	503	435	313	274	221	241	233	224	167	157	159	171	180	87	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7604	8
41-45	57	171	280	196	151	109	503	435	313	274	221	241	233	224	167	157	159	171	180	87	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1335	12
46-50	26	158	312	368	336	241	212	185	201	164	3	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	196	0
51-55	4	22	18	28	45	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Totals	563	2389	3965	3917	3188	2359	2047	1578	1429	1127	740	708	619	518	418	355	343	365	309	192	51	31	22	20	22	20	13	11	6	10	16	5	1	0	0	0	27401	32

### Cumulative Sums: Surface Supplied

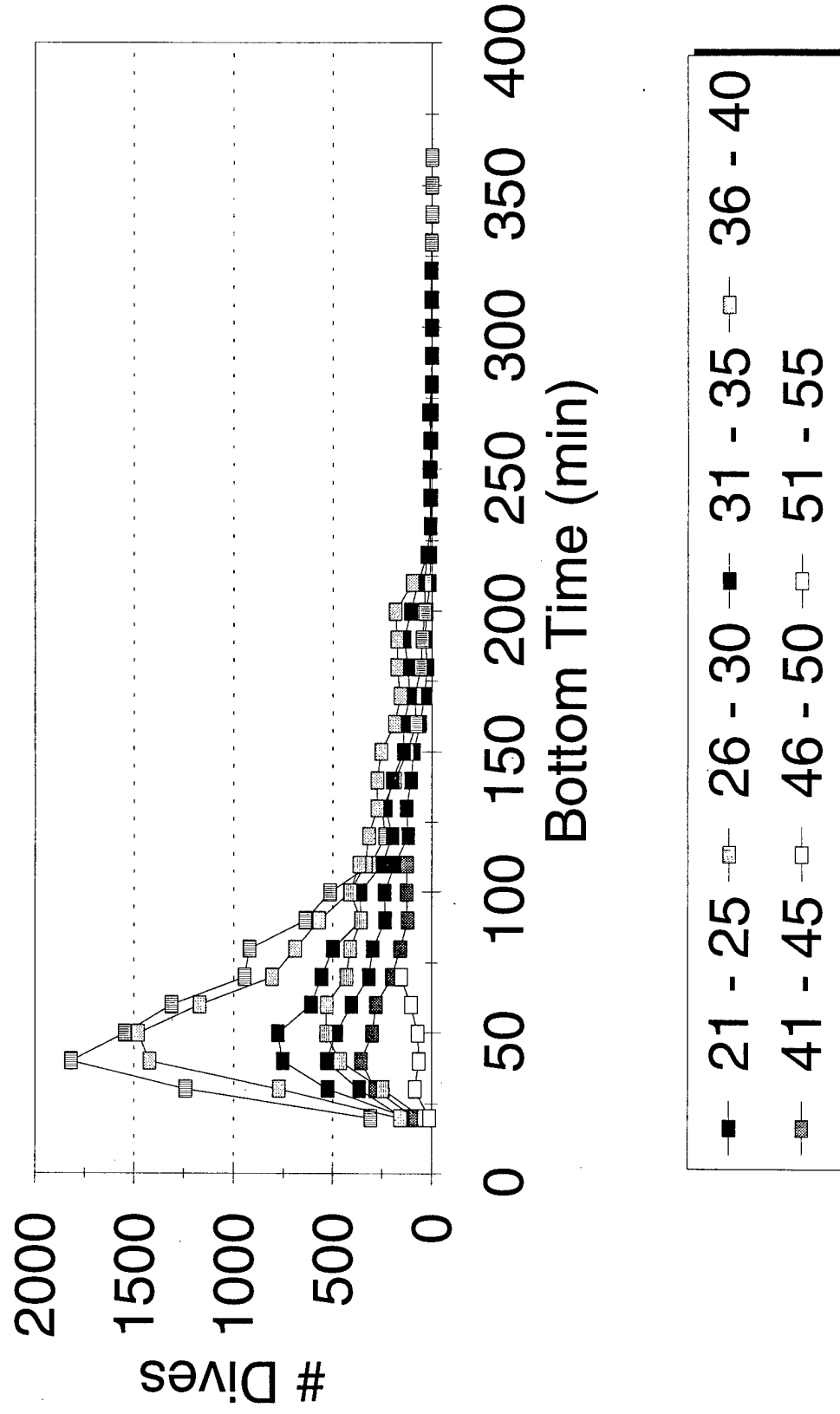
21-25	88	307	648	978	1239	1467	1657	1827	1987	2155	2252	2347	2433	2501	2546	2578	2598	2626	2654	2666	2675	2684	2688	2689	2702	2703	2707	2710	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	2712	27
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### Total

B.T. →	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	No-D Li
21-25	139	367	533	485	408	318	298	236	240	189	120	129	105	91	81	38	24	36	30	13	10	9	7	12	13	4	3	2	0	0	0	0	0	0	0	0	3932	0
26-30	263	1039	1551	1551	1315	946	690	568	415	336	319	278	276	257	190	161	177	176	186	101	2	3	4	9	6	19	5	3	2	3	0	0	0	0	0	0	6335	0
31-35	789	3101	5272	7891	6101	5572	5012	3601	2761	2151	1601	1211	901	721	571	441	331	241	171	121	81	51	31	19	11	6	3	2	1	0	0	0	0	0	0	0	6335	0
36-40	181	772	1425	1481	1172	807	690	568	415	336	319	278	276	257	190	161	177	176	186	101	2	3	4	9	6	19	5	3	2	3	0	0	0	0	0	0	6335	0
41-45	85	286	360	382	282	202	159	123	71	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	2047	13
46-50	40	249	463	535	533	433	357	11	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3932	18
51-55	14	86	66	73	107	157	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	503	0
Totals	860	3532	5419	4427	3421	2980	2287	2072	1577	896	893	772	620	475	400	363	402	363	223	66	31	33	38	25	36	13	11	6	10	16	6	1	0	0	0	0	37501	41

# Figure A3

## Civilian Dives



# Table A4

Distribution of Dives by Depth and Bottom Time

## Marine Dives

### Scuba

B.T. →	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Total	# Bay No-D L	
Depn	78	189	359	247	220	155	55	22	28	2	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1356	0	
26-30	37	186	237	178	161	112	36	22	25	12	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1008	0	
31-35	12	125	108	107	74	46	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	527	0	
36-40	17	79	168	130	55	66	5	6	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	205	1	
41-45	8	20	58	43	40	27	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	271	0	
46-50	2	32	74	91	57	10	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	146	0	
51-55	0	13	58	38	19	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	152	644	1062	834	626	434	108	52	54	17	2	5	1	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3995	1

### Cumulative Sums: Scuba

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### Surface Supplied

B.T. → Depth	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	No-D L
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Totals	7	17	13	4	7	10	12	6	3	6	9	4	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109	2

### Cumulative Sums: Surface Supplied

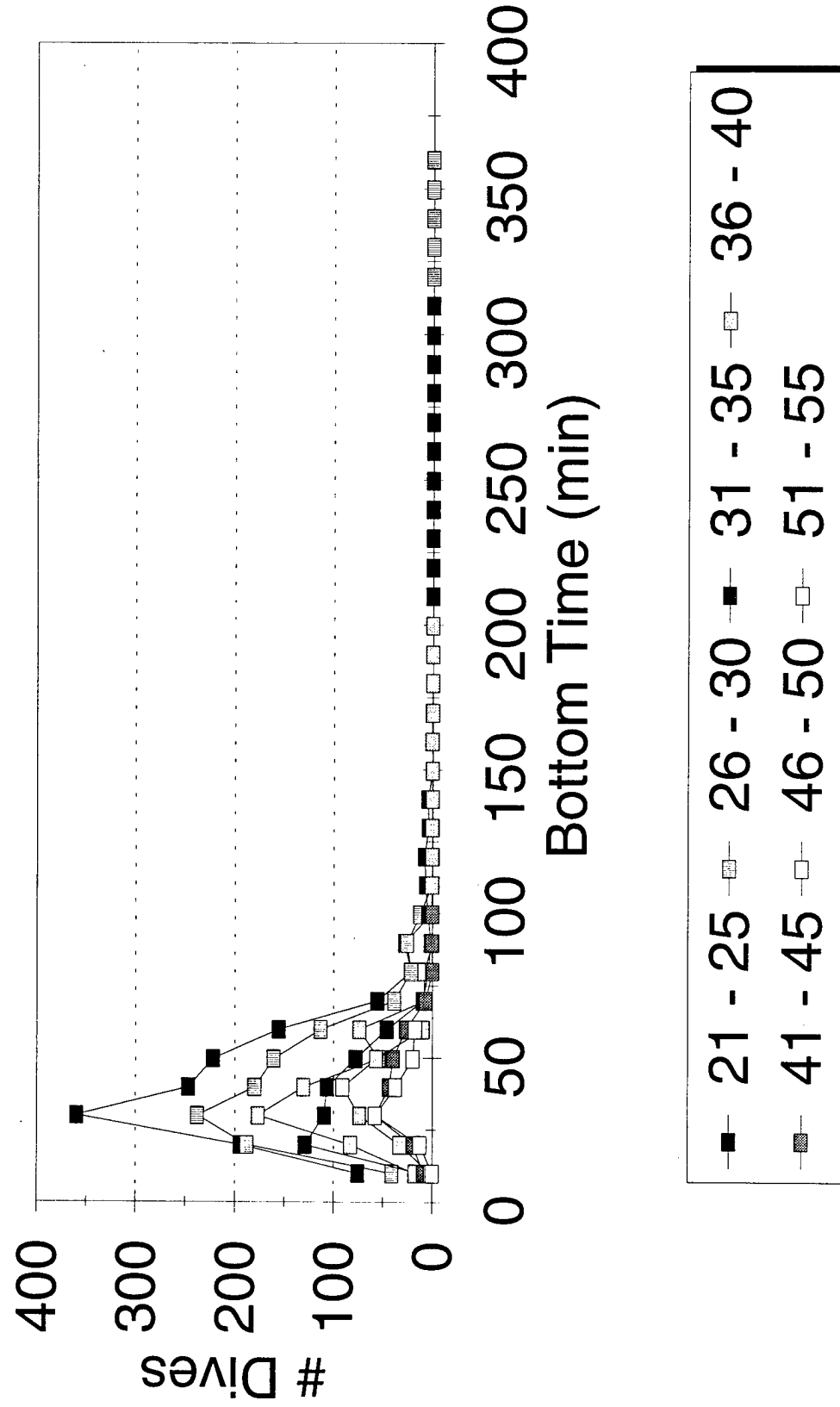
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26-30	4	10	11	13	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
31-35	5	15	17	19	23	24	29	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	
36-40	6	20	22	22	26	26	31	33	34	39	40	41	42	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	
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Totals	7	17	13	4	7	10	12	6	3	6	9	4	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109	2		

### Total

B.T. → Depth	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241-250	251-260	261-270	271-280	281-290	291-300	301-310	311-320	321-330	331-340	341-350	351-360	Totals	No-D L	
21-25	78	189	359	247	222	155	55	22	28	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1367	0	
26-30	41	186	237	178	161	112	36	22	25	12	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1023	0	
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Totals	159	661	1075	838	633	444	120	58	57	23	11	9	6	6	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1048	0

# Figure A4

## Marine Dives

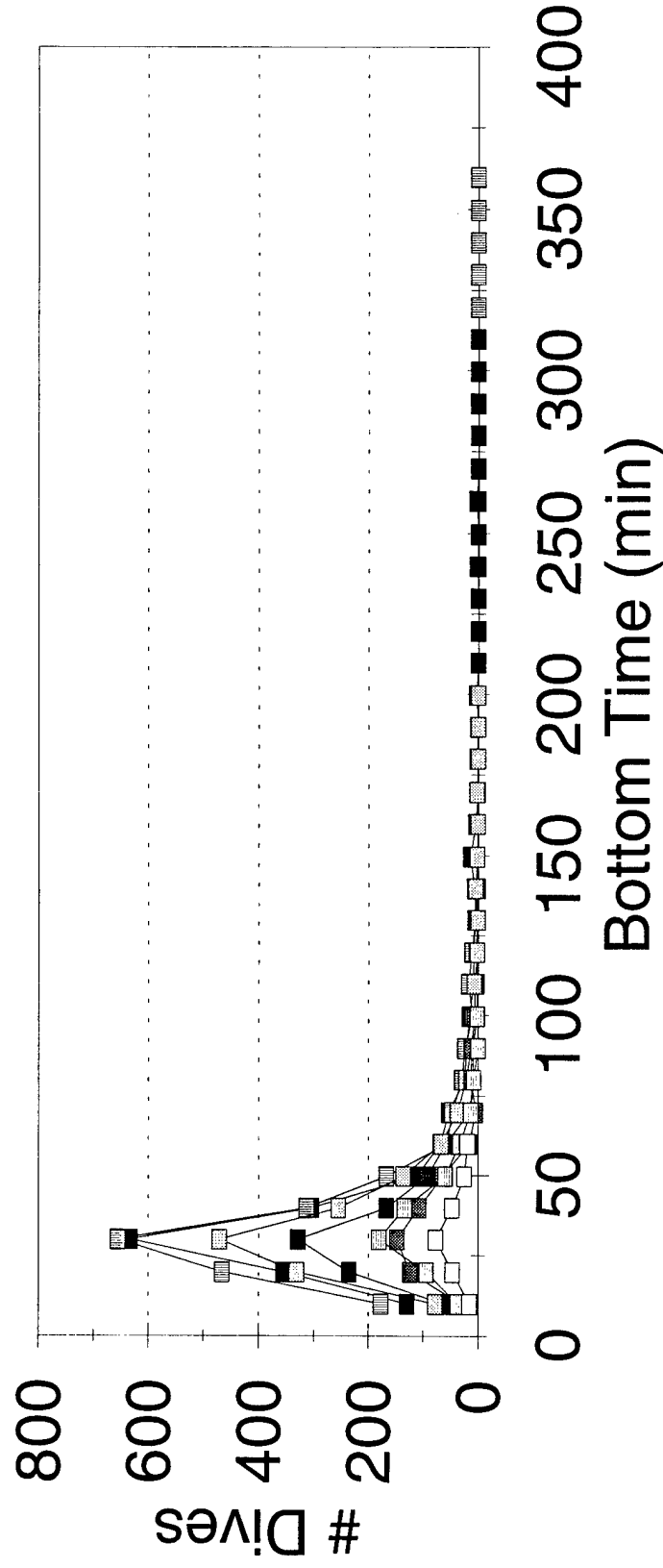


21	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355	360	365	370	375	380	385	390	395	400	405	410	415	420	425	430	435	440	445	450	455	460	465	470	475	480	485	490	495	500	505	510	515	520	525	530	535	540	545	550	555	560	565	570	575	580	585	590	595	600	605	610	615	620	625	630	635	640	645	650	655	660	665	670	675	680	685	690	695	700	705	710	715	720	725	730	735	740	745	750	755	760	765	770	775	780	785	790	795	800	805	810	815	820	825	830	835	840	845	850	855	860	865	870	875	880	885	890	895	900	905	910	915	920	925	930	935	940	945	950	955	960	965	970	975	980	985	990	995	1000	1005	1010	1015	1020	1025	1030	1035	1040	1045	1050	1055	1060	1065	1070	1075	1080	1085	1090	1095	1100	1105	1110	1115	1120	1125	1130	1135	1140	1145	1150	1155	1160	1165	1170	1175	1180	1185	1190	1195	1200	1205	1210	1215	1220	1225	1230	1235	1240	1245	1250	1255	1260	1265	1270	1275	1280	1285	1290	1295	1300	1305	1310	1315	1320	1325	1330	1335	1340	1345	1350	1355	1360	1365	1370	1375	1380	1385	1390	1395	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	1450	1455	1460	1465	1470	1475	1480	1485	1490	1495	1500	1505	1510	1515	1520	1525	1530	1535	1540	1545	1550	1555	1560	1565	1570	1575	1580	1585	1590	1595	1600	1605	1610	1615	1620	1625	1630	1635	1640	1645	1650	1655	1660	1665	1670	1675	1680	1685	1690	1695	1700	1705	1710	1715	1720	1725	1730	1735	1740	1745	1750	1755	1760	1765	1770	1775	1780	1785	1790	1795	1800	1805	1810	1815	1820	1825	1830	1835	1840	1845	1850	1855	1860	1865	1870	1875	1880	1885	1890	1895	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090	2095	2100	2105	2110	2115	2120	2125	2130	2135	2140	2145	2150	2155	2160	2165	2170	2175	2180	2185	2190	2195	2200	2205	2210	2215	2220	2225	2230	2235	2240	2245	2250	2255	2260	2265	2270	2275	2280	2285	2290	2295	2300	2305	2310	2315	2320	2325	2330	2335	2340	2345	2350	2355	2360	2365	2370	2375	2380	2385	2390	2395	2400	2405	
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# Figure A5

## Reserves Dives



■ 21 - 25   ■ 26 - 30   ■ 31 - 35   ■ 36 - 40  
□ 41 - 45   □ 46 - 50   □ 51 - 55

## APPENDIX B

### Part I. Summary of Cases

#### Code

##### Purpose of Dive

SW = SPECWAR  
SH = Ship Husbandry  
TN = Training  
UC = Underwater Construction  
SR = Search  
SS = Security Swim  
EO = EOD  
SV = Salvage  
RQ = Requal  
IS = Inspection

#### Rig

SO = Open circuit SCUBA  
SS = Surface-supplied

#### NMRI Diagnosis

##### Class

1 = Definitely Decompression Illness  
2 = Definitely not Decompression Illness  
3 = Uncertain if Decompression Illness or not

##### SubClass

A = Decompression Sickness  
B = Arterial Gas Embolism  
C = Decompression Sickness or Arterial Gas Embolism  
N = Not applicable

#### Naval Safety Center Diagnosis (SAFE Dx)

1 = Type I Decompression Sickness  
2 = Type II Decompression Sickness  
3 = Arterial Gas Embolism

#### Service

N = Navy  
M = Marine  
C = Civilian

### Part II. Case Descriptions

Narratives exactly as received from NSC; "(sic)" used to denote obvious and/or distracting errors  
Cases with bottom times longer than the USN93 limit are indicated with an asterisk.

# Part I. Summary of Cases

Case #	Day	Month	Year	Purpose	Rig	Depth	Bottom Time	NMRI Diagnosis		SAFE Dx	Service
								Class	Subclass		
1	3	2	90	SW	SO	50	52	3	N	2	N
2	3	2	90	SW	SO	50	52	3	N	2	N
3*	2	3	90	SW	SO	30	397	3	N	2	N
4*	16	3	90	SW	SO	30	397	1	A	2	N
5	21	3	90	TN	SS	52	13	1	A	2	N
6	18	4	90	TN	SO	45	46	1	A	1	M
7	9	6	90	UC	SS	52	46	1	A	1	N
8	7	8	90	SH	SO	40	74	1	A	2	C
9	29	8	90	SW	SO	29	135	1	A	2	N
10	23	10	90	SS	SO	36	30	3	N	2	N
11*	6	11	90	SH	SS	40	189	1	A	2	N
12	5	12	90	SH	SS	26	50	3	N	2	N
13	15	1	91	SR	SS	55	29	2	N	2	N
14	27	1	91	SH	SS	27	17	1	C	2	N
15	1	2	91	SH	SS	30	30	1	C	2	N
16	11	2	91	SH	SS	37	134	1	A	1	N
17	5	4	91	SH	SO	35	76	1	C	2	N
18	16	2	93	SH	SS	31	87	2	N	2	N
19	23	3	93	SH	SS	41	99	2	N	2	N
20	29	3	93	SH	SS	42	97	3	N	2	N
21*	21	7	93	SW	SO	33	278	1	A	1	N
22	9	8	93	SH	SS	25	140	3	N	2	N
23	16	3	94	RC	SO	30	45	1	A	2	N
24	21	4	94	SH	SS	22	91	3	N	2	N
25	27	5	94	SH	SS	38	91	1	C	2	C
26	12	7	94	SW	SO	28	265	2	N	2	N
27	8	8	94	SH	SO	45	15	3	N	2	N
28	8	8	94	SH	SS	36	113	1	A	2	N
29	17	8	94	SR	SO	27	73	3	N	2	N
30	29	1	90	TN	SO	22	29	1	C	3	N
31	14	2	90	SW	SO	40	121	1	C	3	N
32	24	4	90	TN	SO	24	40	1	A	3	N
33	21	5	90	SW	SO	36	50	2	N	3	N
34	21	5	90	SW	SO	36	50	3	N	3	N
35	19	7	90	SR	SS	26	61	1	C	3	N
36*	21	8	90	SH	SS	37	176	1	A	3	N
37	29	10	90	SH	SS	25	44	1	C	3	N
38	12	11	90	SV	SS	33	134	3	N	3	N
39*	9	1	91	SH	SS	34	191	3	N	3	N
40	4	4	91	SR	SO	40	3	2	N	3	N
41	30	5	91	SV	SO	35	52	1	C	3	N
42	30	5	91	SV	SO	35	52	3	N	3	N
43	11	6	91	EO	SO	50	40	1	A	2	N
44	16	7	91	SH	SS	26	25	1	C	3	N
45	1	8	91	TN	SS	29	22	3	N	3	N
46	5	9	91	SW	SO	29	74	1	C	3	N
47	7	10	91	SH	SS	35	115	3	N	3	N
48	6	11	91	EO	SO	45	23	1	B	3	N
49	16	2	93	IS	SO	47	57	1	C	3	C
50	25	2	93	SS	SO	40	20	1	B	3	N
51	16	3	93	RC	SO	42	20	1	B	3	N
52	21	3	93	SV	SS	52	58	1	C	3	N
53	27	7	93	SR	SO	22	25	2	N	3	N
54	31	8	93	SH	SS	28	37	1	B	3	N
55	13	10	93	SR	SS	35	43	1	A	3	N
56	18	11	93	IS	SO	23	44	1	A	3	N
57	28	1	94	EO	SO	37	20	3	N	3	N
58	23	2	94	EO	SO	40	20	1	B	3	N
59	25	3	92	SW	SO	25	40	1	A	3	N
60	30	8	92	SH	SS	21	63	1	A	2	N

## **Part II. Case Descriptions**

### **Case 1**

This 27 year old male spec war diver made a no "D" dive using SCUBA. The dive was on air to 50 fsw for :52. Upon surfacing the diver experienced extreme fatigue following submarine lock out. The diver was examined and no other deficit was found. He was compressed to 60 fsw and had complete relief :55 at depth. The diver was treated on a TT 6 with one extrnsion (*sic*) at 60 fsw. No meds were used, final diagnosis was DCS II, treated by DMO, 2 days loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 2**

This 25 year old male Spec War diver made a no "D" dive using SCUBA. The dive was on air to 50 fsw for :52. Upon surfacing the diver experienced extreme fatigue following submarine lock out. The diver was examined and no other deficit was found. He was compressed to 60 fsw and had complete relief :55 at depth. The diver was treated on a TT 6 with one extension at 60 fsw. No meds were used, final diagnosis was DCS II, treated by DMO, 2 days loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 3\***

This 40 year old male Spec War diver made an SDV dive using open circuit SCUBA. The dive was to 30 fsw for 6 hours and 37 mins. The dive was reported as a no "D" dive. According to standard air tables the dive was 40 for 480 exceptional exposure because the max time of the repetative (*sic*) group designator table was exceeded. After a restless night the diver reported to work in the morning. Physical discomfort was reported to the diving supervisor. A neurological exam was normal but neuropsych screening was borderline. The diver was compressed to 60 fsw and treated on a treatment table 6. No meds were used. No days loss of work, 4 days restricted from diving, final diag. DCS Type Type (*sic*) II by DMO. The other diver on this dive had DCS II and treated (*sic*).

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 4\***

This 41 year old male Spec War diver make (*sic*) an SDV dive using open circuit SCUBA. The dive was to 30 fsw for 6 hrs and 37 mins. The dive was reported as a no "D" dive. According to standard air tables the dive was 40 for 480 exceptional exposure because the max time of the repetitive group designator table was exceeded. The following morning the diver reported a restless evening and a physical discomfort to the Div Sup. A neuro revealed decreased light touch and pin prick sensation over right lateral thigh. The diver was compressed to 60 fsw and treated on a TT 6. No meds were used, no loss days from work, 4 days restricted from diving. Final diag. DCS II by DMO. The other diver on this dive had DCS II and treated (*sic*).

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 5**

This 29 year old Navy male 1<sup>st</sup> class diving student made a training dive using Mark XII SSDS air. The dive was to 52 fsw for :13 min bottom time no "D". Forty five minutes after surfacing he reported pain in the left shoulder and elbow. A neuro also revealed nystagmus in the right eye. The diver was compressed to 60 fsw and treated on a TT 6 with 2 extensions at 60 fsw. Complete relief was noted at 8 mins. into 2<sup>nd</sup> O2 period at 60 fsw. Medications used: 1000 cc of normal saline. Two days loss of work and 14 days restricted from diving. Final diagnosis DCS Type 2 by MDV.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 6**

This 20 year old male Marine Corps SCUBA student made an open water SCUBA training dive. The dive was to 45 fsw for :46 min no "D". Nine hours after surfacing the diver complained to the supervisor of pain in the left knee. A neuro was conducted and neurological deficit was found. The diver was compressed to 60 fsw and treated on a TT 6. Complete relief occurred during the 4<sup>th</sup> O2 period at 60 fsw. No drugs were used, no days loss from work and 28 days restricted from diving. Final diagnosis was DCS Type one by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type I Decompression Sickness

### **Case 7**

This 21 year old male 2<sup>nd</sup> class diver made an underwater const. ops dive in open water using MK XII, air, swimmers configuration. The depth was to 52 fsw for 46 min no "D". Approx. five minutes after surfacing the diver noted a dull pain behind right kneecap. A neuro was completed by a DMT with no other findings. The same pain waxed and waned over the next 50 minutes. The diver was compressed to 60 fsw, complete relief was obtained upon reaching treatment depth. Treated on a treatment table 5, no days loss of work, 5 days restricted from diving, no meds used, final diagnosis DCS I by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type I Decompression Sickness

### **Case 8**

This 26 year old male ship yard diver made a ships husbandry dive using open circuit SCUBA. The dive was to 40 fsw for 19 minutes no "D". The previous day this diver made a no "D" dive to 40 fsw for 74 minutes bottom time. During ascent of this dive he noticed pain in his right hip. This pain was not reported. The next dive he made the 40 fsw for :19 dive. He noticed the pain improved on the bottom of this dive. On ascent this pain increased. Upon surfacing he was taken to the DMO and compressed to 60 fsw and had complete relief upon reaching treatment depth. Due to the location of the pain he was treated on a TT 6 with one extension at 60 fsw. No meds were used, one day loss of work, 14 days restricted from diving, final diagnosis was DCS II by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 9

This 24 year old male SEAL made an SDV training dive with SDV air system and full face mask. The gas media was air. The dive was to 29 fsw for 2:15 no "D". :45 after surfacing the diver reported numbness to left nostril and left quadriceps. He was compressed to 60 fsw and had complete relief upon reaching treatment depth. No meds were used, no days loss of work, 14 days restricted from diving. Final diagnosis was Type 2 DCS by DMO. Suspect circulation impaired by tightness of equipment.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 10

This 24 years old male SCUBA diver made a security swim using open circuit SCUBA. The dive was to 36 fsw or (*sic*) :30 BT. Approx 3 hours after the dive this diver became dizzy, felt nauseated and had a painful left ear. A neuro was performed by a DMO and DCS Type II was diagnosed. The diver was transported to a recompression chamber and compressed to 60 fsw on O2. Complete relief was obtained during the 1<sup>st</sup> O2 period. He was treated on a TT 6, Meclizine was given, no days loss of work, 30 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 11\*

This 23 year old 2<sup>nd</sup> class diver made a ships husbandry using MK 21 air. The dive was to 40 fsw for 180 minutes no "D". Approx one hour after surfacing the diver noticed pain and a slight numbness in his left forearm. The diver did not report these symptoms until five hours later. He was compressed to 60 fsw on O2 and had 1<sup>st</sup> relief on descent at 30 fsw. Complete relief was obtained 33 minutes into the treatment. A TT 6 was completed, no meds were used, no days loss of work and 14 days restricted from diving. Final diagnosis DCS Type II by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 12

This 19 year old 2<sup>nd</sup> class diver made a ships husbandry dive using MK 21 air. The dive was to 26 fsw for :50. No "D". Upon surfacing this diver reported that his foot was numb. A neuro was completed with no significant findings. He was transported to a chamber and treated on a TT 6. First relief was noted :13 into the treatment and complete relief at :29. No meds were used, no days loss of work and 21 days restricted from diving. Final diagnosis was DCS II by DMO. Phoncon to his master diver, who was TAD at the time of the dive and the treatment, reported that this diver was very cold and tired and wore an ill fitting wet suit. He feels that the DCS II diagnosis was highly unlikely due to the dive profile.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 13

This 33 year old Navy Saturation Diver made a search dive using MK 21. The dive was to 55 fsw for :29 BT no "D". Upon surfacing the diver noticed numbness and tingling in the top of his left foot. The diver also reported that his boot was too tight. MDV and DMT performed thorough neurological examination. No other findings were noted. DCS could not be ruled out so the diver was compressed to 60 fsw on O2. Partial relief of symptoms were noted after :03 at depth and complete relief was obtained after :14. No meds were used, no days loss of work and 14 days restricted from diving. Final diagnosis DCS Type II by MDV and DMT.

**NMRI Diagnosis:** Definitely not decompression illness

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 14

This 32 year old Navy HeO2 diving officer made a ships husbandry dive using MK-1 air. The dive was to 27 fsw for :17 BT. :67 after surfacing the diver complained of left arm tremors, numbness, and weakness. Deamethasone (*sic*) 10 MGM was given during medivac to the recompression chamber. He was compressed to 60 fsw on O2. First relief was obtained upon reaching depth and complete relief during the first O2 breathing period. He was treated on a TT six. Three days loss of work. 28 days refricted (*sic*) from diving. Final diagnosis DCS II.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 15

This 28 year old Navy 1<sup>st</sup> class diver made a ships husbandry dive using MK-1 air. The dive was to 30 fsw for :30 no "D". Approx 15 min after surfacing the diver felt slight disorientation but did not report this until 40 mins later. A neuro exam revealed vestibular imbalance and lower extremity weakness. He was placed on O2 and transported to recompression chamber.

Compression was to 60 fsw on O2. Complete relief was obtained 22 minutes into the treatment.

A TT 6 was completed. No meds were used, one day loss of work and 7 days restricted from diving. Final diagnosis was DCS Type II by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 16

This 20 year old male 2<sup>nd</sup> class diver made a ships husbandry dive using ESDS AGA. The dive was to 37 fsw for 2:14 no "D". Approx. four hours after the dive the diver (*sic*) the diver complained of pain in the right thigh. No type two symptoms were noted. The diver was compressed to 60 fsw and had first relief eight minutes into the treatment. Complete relief was noted twenty one minutes later. A TT 6 was completed. No meds were used, no days loss of work, 7 days restricted from diving. Final diagnosis, DCS 1 by MDV.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type I Decompression Sickness

### **Case 17**

This 30 year old 1<sup>st</sup> class diver made a ships husbandry dive using open circuit SCUBA. The dive was to 35 fsw for 1:16. Thirty minutes after surfacing the diver complained that his left hand was not feeling as it should. A neuro exam showed numbness of the left thumb, index, and middle finger. He was compressed to 60 fsw on O2. First relief was noted upon reaching treatment depth and complete relief :09 into the treatment. A TT 6 was completed. No meds were used, no days loss of work and 14 days restricted from diving. Final diagnosis was DCS II by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 18**

This 22 year old male 2<sup>nd</sup> class diver made a ships's (*sic*) husbandry dive using MK 21. The dive was to 31 fsw for 8M (*sic*) mins. Three weeks after dive this diver reported severe headaches, dizziness, and memory loss. Neuro exam conducted by DMO and MDV with no neuro deficit noted. Referred member to Naval Hospital for full neurological testing and decision made to treat member on htperbaric (*sic*) oxygen. Recompressed to 60 fsw with no relief noted during treatment. A TT6 was completed. No meds were used. 17 days loss of work and 17 days restricted from diving.

**NMRI Diagnosis:** Definitely not decompression illness

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 19**

This 26 year old male first class diver made a MK-21 dive to 41 fsw for 99 mins while inspecting patches for leaks during salvage operations on a ship. 4 hrs 50 mins after surfacing diver complained of numbness to left great toe. Neuro exam conducted with no other symptoms noted. Diver recompressed to 60 fsw and treated on a TT-6 for DCS type II. Diver had complete relief 4 hrs 37 mins into the treatment. No meds were used. No days loss of work and 14 days restricted from diving.

**NMRI Diagnosis:** Definitely not decompression illness

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### **Case 20**

This 21 year old male second class diver made a ship's (*sic*) husbandry dive using ESDS to a maximum depth of 42 fsw for 1 hr 37 mins. Approximately 10 hrs after surfacing diver reported radiating pain in his left leg and "something not being quite right". Neuro exam revealed numbness on the left leg from the knee to the toes and weakness in the lower extremity of the left leg. Diver recompressed to 60 fsw and treated on TT6 for DCS Type II. Complete relief noted 5 hrs 4 mins into treatment. No meds were used. 1 day loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness



**Case 21\***

This 29 year old male SEAL Diver made a SCUBA hookah dive from a Dry Deck Shelter (DDS) to 33 fsw for 4 hrs 38 mins. During drain down at 20 fsw diver noticed pain in his lower back. Drain depth was increased to 30 fsw for duration with no change noticed by diver. Upon surfacing a neuro exam was conducted with no other symptoms noted. Diver was recompressed to 60 fsw and treated on TT5 for DCS type I. Diver had complete relief 1 min into the treatment. No meds were used. No days loss of work and 2 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type I Decompression Sickness

**Case 22**

This 22 year old male second class diver made a dive to perform a shaft wrap using MK 21. His dive profile was 25 fsw for 2 hrs 20 mins. While removing his gear on the surface the diver noticed that his right foot seemed to drop and he had decreased sensation over the dorsum of the right foot. Neuro exam was conducted with no other neurological symptoms noted. Diver recompressed (*sic*) to 60 fsw and treated on a TT-6 for DCS type II. Diver had some relief 25 mins into the treatment but remained unchanged during the rest of the treatment. 1000 ML of Ringers Lactate administered IV. One day loss of work and 21 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

**Case 23**

This 22 year old male second class diver made a recreational dive using open circuit scuba to 30 fsw for 45 mins. 2 hours after surfacing diver noticed intermittent tingling radiating from his right shoulder to his hand. Diver noticed right arm feeling numb the following morning and reported symptoms. Neuro exam revealed marked weakness to right arm and numbness of right shoulder to hand. Diver recompressed to 60 fsw and treated on TT 6 for DCS type II. No drugs were used. Diver had complete relief 3 hours and 14 mins into the treatment. 2 days loss of work and 30 days restructured (*sic*) from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

**Case 24**

This 38 year old male Master Diver made a ships husbandry dive using MK 21 to a depth of 22 fsw for 1 hr 31 mins. Diver surfaced with soreness in his right arm and feeling tired. Diver did not report these symptoms for two days. Neuro exam revealed right arm pain and soreness. Diver also was very fatigued. Diver recompressed to 60 fsw and treated on TT 6 for DCS Type II. No drugs were used. Diver had complete relief of symptoms 2 hrs 45 mins into the treatment. No days loss of work and 30 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

**Case 25**

This 36 year old male civilian rigger diver made a ship's husbandry dive to 38 fsw for 1 hr 31 mins using MK 21. Upon surfacing the diver noticed the tip of his fifth digit on his left hand felt numb. Diver sup felt it may have been caused by a mechanical injury. After the diver had showered and warmed up he noticed the numbness had spread to his next finger. Diver transported to nearest chamber and recompressed to 60 fsw and treated on TT 6 for DCS Type II. No drugs were used. Diver had complete relief 23 mins into the treatment. No days loss of work and 14 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

**Case 26**

This 23 year old male SEAL Diver made a SCUBA dive while conducting SDV diving operations. During the dive the diver reported that his wet suit was very tight and restrictive. Upon completion of his dive the diver noticed a patch of numbness on his left forearm. Neuro exam revealed no other symptoms. Diver was recompressed to 60 fsw and treated on TT 6 for possible DCS Type II. Diver had no relief of symptoms during the treatment. No days loss of work and 5 days restricted from diving.

**NMRI Diagnosis:** Definitely not decompression illness

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

**Case 27**

This 24 year old male Navy SCUBA diver made a ship's husbandry dive to 45 fsw for 15 mins using open circuit SCUBA. Appox 1 and 1/2 hrs after surfacing diver complained of feeling "heavy" and tired. Diver was recompressed to 60 fsw and treated on TT 6 for DCS Type II. Diver had complete relief of symptoms 50 mins into the treatment. 4 Liters Ringer's Lactate IV was used. No days loss of work and 30 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

**Case 28**

This 28 year old male First Class Diver made a ship's husbandry dive to 36 fsw for 1 hr 53 mins using MK -20. Appox 1 hr after surfacing diver developed a headache and fatigue. The next morning he reported his symptoms to the Diving Supervisor. Diver was recompressed to 60 fsw and treated on TT 6 for DCS type II. Diver had complete relief of symptoms 33 mins into the treatment. No drugs were used. No days loss of work and 30 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 29

This 30 year old male USMC combat diver made a compass/navigation dive to 27 fsw for 1 hr 13 mins using open circuit SCUBA. Approx 30 mins after surfacing diver complained of tingling in his right forearm. Diver recompressed to 60 fsw and treated on TT6 for DCS type II. Diver had complete relief of symptoms 1 hr 54 mins into the treatment. No drugs were used. No days loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

### Case 30

This 22 year old female student officer made a training dive using SCUBA. The dive was to 29 fsw for :29 min No D. Approx. upon surfacing she complained of a mild headache. A neuro was conducted by a DMO and no deficits were found. Oral motran (*sic*) was given at this time. Approx. one hour later she reported headache worsening, nauseous (*sic*), lightheaded and “not feeling right”. A second neuro showed: pronounced weakness in left side of neck muscles, weakness in left extremities and degraded neural responses in left foot. Compressed to 165 fsw with 1<sup>st</sup> relief at 04: After leaving the surface. A TT 6A was completed with one extension at 60 fsw. An I.V. of Ringers Lactate was administered during treatment. The following AM left leg weakness was found on follow up neuro. A TT 6 was conducted with 1<sup>st</sup> relief at 1:29. A neuro on the following day still showed left leg weakness. A TT 6 was administered with complete relief at :28. Three days loss of work, 28 days restricted from diving, final diagnosis AGE.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 31

This 20 year old male basic combat swimmer made an SDV training dive using SCUBA. The dive was to 40 fsw for 2 hrs and :01 min. Instructors observed him having difficulty maintaining depth control of the SDV. Upon surfacing the diver was unresponsive and sluggish (*sic*). The diving med tech on scene conducted a neuro and found upper extremity weakness. He was placed on surface O2 and transported to the chamber. He was recompressed (*sic*) to 165 fsw where another neuro by a DMO showed upper extremity weakness, loss of coordination, proprioception and positive Babinski of right foot. Complete relief was obtained within :30 mins at 165 fsw. He was treated on a TT 6AM (*sic*), no meds were used, one day loss of work, 60 days restricted from diving, final diagnosis AGE.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### **Case 32**

This 20 year old male Navy diving student made a training dive using open circuit SCUBA. The dive was to 24 fsw for :40 mins no "D". He surfaced complaining of feeling light headed. A neurological exam revealed no deficits. Approx. :30 minutes later he complained of pain in the left elbow. A neurological exam again showed no neurological deficits and the diver returned to the dive station. Approx. :20 to :30 the diver complained of tingling in left hand and fingers. Again the neuro was normal. AGE could not be ruled out so the diver was compressed to 165 fsw and treated on a TT 6A. Relief was obtained at :05 mins at treatment depth. No meds were used, no days loss of work and 28 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### **Case 33**

This 24 year old male UDT diver made a SPEC WAR ops dive using open circuit SCUBA. The dive was to 36 fsw for 50 minutes no "D" two minutes after surfacing this divers buddy experienced nausea and vomiting. A rapid upward excursion of approximately 12 fsw occurred during submarine lock in lock outs. A diagnosis of AGE could not be ruled out on the other diver so both divers were compressed to 165 fsw. 6 minutes after reaching treatment depth the afflicted diver was asymptomatic and neuros were normal in both divers. The divers air was obtained from the submarine's hp flasks and contamination could not be ruled out. An air sample was never recovered due to a mix up of SCUBA bottle during the transport of divers. No drugs were used one day loss of work and 30 days restricted from diving. Final diagnosis AGE by DMO.

**NMRI Diagnosis:** Definitely not decompression illness

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### **Case 34**

This 21 year old UDT diver made a SPEC WAR ops dive using open circuit SCUBA. The dive was to 36 fsw for 50 minutes. Two minutes after surfacing this diver experienced nausea and vomiting. A rapid upward excursion of approximately 12 fsw occurred during submarine lock in lock out. A diagnosis of AGE could not be ruled out. This diver was compressed on to (*sic*) 165 fsw where he had complete relief after 6 minutes at treatment depth. A neuro was conducted at depth and was reported as normal. The divers (*sic*) air was obtained from the submarine's HP flasks and contamination could not be ruled out. An air sample was never recovered due to a mix up of SCUBA bottles during the transport of the divers. No drugs were used, one day loss of work, 30 days restricted from diving, final diagnosis AGE by DMO.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 35

This 18 year old male 2<sup>nd</sup> class diver made a searching dive using MK XXI air. The dive was to 26 fsw for 61 min. no "D". The members head being too small for the liner the oral nasal mask did not make a proper seal. This caused the mask to free flow. From 21 fsw to the surface this happened 3 times. Approx. 20 minutes after surfacing the diver noticed that he was feeling unusually tired he did not report this. 45 mins later he was found asleep. Upon being awakened it was noted that he had poor balance. A neuro produced a poor Romberg and patient was deteriorating rapidly. Compression to 165 commenced and complete relief was obtained at 100 fsw. A TT, (*sic*) 6A was completed. No meds were used, 3 days loss of work, 30 days restricted from diving, final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 36\*

This 27 year old male 2<sup>nd</sup> class diver made a ships husbandry dive using ESDS air. The dive was to was to (*sic*) 37 fsw for 2 hours and 56 minutes no "D". Approx. one hour after surfacing the diver reported fullness around the neck, slight discomfort under sternum and tingling in left thoracic area. Initial neuro was normal. 25 minutes after the initial symptoms the diver reported pain in the left wrist. Another neuro revealed weakness in left leg. He was compressed to 60 fsw for treatment where the diver failed a Rhomberg Test. He was taken of (*sic*) O2 and compressed to 165 fsw (*sic*) All symptoms resolved at treatment depth. The Diver was treated on a TT 6A, and I.V. of Ringers Lactate was given. One days loss of work, 6 weeks restricted from diving, final diagnosis AGE by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 37

This 23 year old 2<sup>nd</sup> class diver made a ships husbandry dive using MK 21 air. The dive was to 25 fsw for :44 min. no "D". Approx. 20 minutes after surfacing this diver experienced weakness, dizziness and fatigue. The dive was uneventful except he stated that his hat free floowed (*sic*) on two occasions during the dive. A neuro showed unsteady gait, Romberg Test was abnormal and a loss of feeling on portions of his back. A chest X-ray disclosed mediastinal emphysema. The diver was compressed to 60 fsw on O2 and had first relief after two minutes at 60 fsw with complete relief after the 2<sup>nd</sup> O2 period. A TT 6 was completed with one extension at 60 fsw. No meds were used, no days loss of work and 28 days restricted from diving. Final diagnosis possible AGE caused by improper fit of MK 21 diving helmet.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 38

This 25 year old male 1<sup>st</sup> class diver made a salvage dive using MK 21 air. The dive was to 33 fsw for 2:14 no "D". During the last three minutes of the dive this diver reported sudden onset of nausea, vertigo and headache. He vomited three times on the bottom. After several vents the diver was surface (*sic*). During the up and over phase the diver had trouble holding the ladder. A neuro conducted by the MDV confirmed weakness in shoulder and elbow muscle groups on left side. He was transported on O<sub>2</sub> to chamber. Compressed to 165 fsw with first relief at 2 minutes on the bottom. Relief of all symptoms at 29 minutes. A TT 6A was completed. No meds were used, no days loss of work, 28 days restricted from diving. Final diagnosis hypercapnia and AGE.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 39\*

This 28 year old male 1<sup>st</sup> class diver made a ships husbandry dive using ESDS (AGA) on air. The dive was to 34 fsw for 3:11 no "D". Approx 15 to 20 minutes after the dive this diver noticed a loss of hearing in his left ear. No other neurological deficits were noted. Diver was compressed to 165 fsw. EDU was notified of mishap and concurred with treatment. First relief was noted at 1:45 into the treatment at 60 fsw on O<sub>2</sub>. A TT 6A was completed with no extensions. The diver surfaced with substantial relief. No meds were used, one day loss of work and 30 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 40

This 24 year old female diving officer made searching dive using open circuit SCUBA. The dive was to 40 fsw for 3 minutes. While at depth this diver reported vertigo. The dive was aborted. On the surface she complained of dizziness and severe headache. A neuro revealed neurological deficits heel to toe walk. The diver was compressed to 165 fsw. 1<sup>st</sup> relief was noted upon reaching treatment depth. Complete relief was noted 2 minutes into the 2<sup>nd</sup> O<sub>2</sub> period at 60 fsw. (*sic*) and I.V. of normal saline and I.V. decadron was given. No days loss of work, 28 days restricted from diving, final diagnosis AGE by MDV.

**NMRI Diagnosis:** Definitely not decompression illness

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

### Case 41

This 20 year old 2<sup>nd</sup> class diver made a salvage dive using open circuit SCUBA. The dive was to 35 fsw for :51 BT. This diver was not acting normal after the dive. A neuro was conducted. He could not pass the Romberg portion of the exam. 11 minutes after surfacing he was compressed to 165 fsw. :13 minutes into the treatment complete relief was obtained. A TT 6A was completed, no meds were used, one day loss of work and 28 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

#### Case 42

This 3M (*sic*) year old 2<sup>nd</sup> class diver made a salvage dive using open circuit SCUBA. The dive was to 35 fsw for :52 BT. Approx. eight minutes after surfacing this diver reported muscle tightness (mechanical injury) in the right arm. He was swinging a hammer at depth. A neuro was performed by a DMO. AGE could not be ruled out for his diving buddy showed neurological deficit in his neuro exam. This diver was compressed to 165 fsw 2 and one half hours after surfacing. A TT 6A was completed with full relief noted :10 into the treatment. No meds were used, one day loss of work and 28 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

#### Case 43

This 21 year old male Navy EOD assistant diver made an EOD dive using open circuit SCUBA. The dive was to 50 fsw for :40 BT no "D". This diver make (*sic*) 3 rapid ascents to the surface from 40 fsw to retrieve buoyant objects. He exceeded 60 fpm on ascent passing his own bubbles. Blood was in his face mask upon surfacing. Symptoms of numbness both hands and feet were noted five hours post dive but not reported until 15 hours after surfacing. He was compressed to 60 fsw on O2, 1<sup>st</sup> relief was obtained upon reaching treatment depth, complete relief at 1:00 into the treatment. TT 6 with 1 ext at 60 fsw was completed. No meds were used, one day loss of work and 28 days restricted from diving. Final diagnosis was DCS II by DMO. Note: reported as DCS II. The dive profile and type of symptoms strongly suggest AGE.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness

#### Case 44

This 37 year old male Navy Sat Diving Officer made a ships husbandry dive using MK 21 on air. The dive was to 30 fsw for :25. After the dive the Diving Supervisor, which was under instruction, performed a training neuro on this diver which revealed a neurological deficit. A lack of communication was aparent (*sic*). The deficit was thought to be manufactured by the diver for the training neuro. The nest (*sic*) day he was evaluated for the deficit. It consisted of personality changes. Lack of coordination and a positive Babinski sign. He was compressed to 60 fsw on O2. Complete relief was noted :19 into the treatment. An I.V. of NACL was used, 2 days loss of work, 35 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

#### Case 45

This 21 year old male Navy diving student made a training dive using Mark 21 on air. The dive was to 29 fsw for :22 BT. :08 after surfacing this diver complained of a headache. A neuro was normal. The diver stated that his headache was worsening. He was compressed to 165 fsw. He reported complete relief on descent at 18 fsw. No meds were used, no days loss of work and 28 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 46**

This 23 year old male SPECWAR Diver made a lock in lock out dive using open circuit SCUBA. The dive was to 29 fsw for 1:14. The diver used a lift bag to float an outboard engine to the surface. Upon surfacing he experienced dizziness. He made a descent for lock in. The neuro was normal except for dizziness. He was compressed to 165 fsw. First relief was noted :02 into the treatment at 60 fsw. Complete relief was noted :10 into the treatment. A TT 6A was completed. An I.V. of Ringers D5W was given. 3 days loss of work, 42 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 47**

This 23 year old male 2<sup>nd</sup> class diver made a ships husbandry dive using ESDS on air. The dive was to 35 fsw for 1:55. This diver (red) noted that he was not feeling well on the bottom and turned over his work to his dive buddy (yellow). Red divers (*sic*) condition did not improve. The supervisor recovered both divers. Once on the surface yellow diver reported the same feeling earlier but it cleared. Red diver on the surface complained of nausea and light-headedness. At the chamber a neuro showed short-term memory loss, difficulty in talking and nystagmus. He was compressed to 165 fsw. First relief was noted upon reaching treatment depth and complete relief at 2:14 into the treatment. A TT 6A was completed. No meds were used, no day loss of work and 30 day restricted from diving. Final diagnosis was AGE by DMO. Cranial nerve deficite (*sic*)

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 48**

This 23 year old male EOD assistant made an EOD OP dive using open circuit SCUBA. The dive was to 45 fsw for :23 BT. While on the bottom this diver experienced a headache and surface (*sic*). On the surface he had extreme weakness and had difficulty remaining alert. He was examined by DMO and MDV. A diagnosis of AGE was made. He was transported to the chamber and compressed to 165 fsw. Complete relief was noted at 130 fsw on descent. At (*sic*) TT 6A was completed. No meds were used, no days loss of work and 42 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism



**Case 49**

This 40 year old male civilian diver made an inspection dive using open circuit SCUBA and a dry suit. The dive was to 47 fsw for 5M mins. 20 mins after surfacing this diver complained of dizziness and nausea. He was diagnosed as having shallow water AGE by DMO. Recompressed to 60 fsw. First relief occurred (*sic*) 4 mins into the treatment followed by complete relief 5 hours and 36 mins into the treatment. A TT6 was completed. No meds were used. No days loss of work and 30 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 50**

This 23 year old male second class diver made a SSBN security swim using surface tended open circuit SCUBA. Diver's tending line snagged on rudder and as he attempted to un snag himself he made an uncontrollable ascent (8 to 10 fsw) to the surface. Dive profile was 40 fsw for 20 mins. Approximately 3 mins after surfacing diver complained of numbness in lips and facial area. While transiting to the chamber diver reported numbness and loss of strength to left arm and shoulder, dizziness, and blurred vision. Seconds prior to entering chamber diver became unconsciousness (*sic*). Recompressed to 165 fsw and treated on TT6A for AGE. Complete relief noted 5 M mins into the treatment. 1000ML 2% sodium chloride IV used. Three days later this same diver reported feeling fatigued, headache, back pain and left elbow pain. Neuro exam conducted revealing pain in back of head, pain middle left side of back, poor coordination, tingling left hand, and slurred speech. Diver recompressed to 60 fsw on a TT6. Complete relief noted 40 mins into the treatment. No meds were used. No days loss of work and 2 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 51**

This 38 year old male HeO2 diving officer was assisting during a recovery of a DSRV using open circuit SCUBA. His dive profile was 42 fsw for 20 mins. 3 mins after surfacing diver became unconscious and had a grand mal seizure. Seizure lasted approximately 1 min and diver regained consciousness about 15 mins later. Diver medivaced to chamber by helo. Neuro exam conducted with no neurological symptoms noted. Diver recompressed to 60 fsw on TT6 for AGE. Ringers lactated (*sic*) used during treatment. No days loss of work and 42 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 52**

This 22 year old male second class diver was patching a wreck using MK 21. His dive profile was 52 fsw for 58 mins. 30 mins after surfacing diver complained of pain in his lower back and stated that he did not feel well. Neuroexam was conducted and a loss of hand to eye coordination and loss of balance was noted. He was recompressed (*sic*) to 165 fsw on a TT6A for AGE. Neuro exam at 165 fsw noted short term memory loss, weakness in the left arm, and drooping facial muscles. Complete relief noted 23 mins into the treatment. No meds were used. Upon surfacing neuro exam revealed roving left eye. Diver recompressed to 60 fsw and treated on TT6. Complete relief noted 19 mins. into the treatment. No meds used. 1 day loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness or Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 53**

This 21 year old male dive student was conducting underwater sonar operations using a hand held Dukane sonar while diving SCUBA. His dive profile was to 22 fsw for 25 mins. Upon handing the sonar to his dive partner he noticed tingling in his 1<sup>st</sup> and 2<sup>nd</sup> fingers on his right hand. Two minutes later he aborted the dive and reported his symptoms to the Diving Supervisor. Diver was transported to the chamber and examined by DMO where he was diagnosed as having fatigue/altered (*sic*) sensation to his right hand due to holding the sonar. DO elected to treat the diver for AGE due to neurological symptom being present. Attempted to recompress diver to 165 fsw but diver had problems clearing and descent was stopped at 71 fsw and diver brought back up to 60 fsw and treated on TT-6. Diver had complete relief of all symptoms at 39 fsw on descent. No meds were used. One day loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Definitely not decompression illness

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 54**

This 24 year old male first class diver made a dive to seal a cofferdam which had developed a leak using MK 20. As the diver was returning to the cofferdam, it blew out a two foot section of the rubber releasing a large air pocket which hit the diver forcing him to the surface. His dive profile was to 28 fsw for 37 mins. Upon surfacing the diver was semi-conscious. A neuro exam was conducted which revealed tingling and loss of sensation in the right upper extremity from the shoulder down through (*sic*) the hand and the left wrist down through the hand. The diver also complained of nausea. Diver was recompressed to 60 fsw and treated on a TT-6 for AGE. Diver had complete relief 22 mins into the treatment. 1000 ml Ringers Lactate and 10 mg Dexamethasone given IV. 1 day loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 55**

This 26 year old male first class diver made a bottom search dive using MK-20 to 35 fsw for 43 mins. 40 mins. after surfacing the diver complained of pain in his left elbow. A neuro exam was conducted and weakness of his left arm and shoulder were discovered as well. Diver was put on O2 and transported to nearest recompression chamber. Diver had complete relief of symptoms enroute to the chamber. Diver recompressed to 60 fsw and treated on TT 6 for AGE. No meds were used. 1 day loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 56**

This 22 year old male second class diver made a dive to inspect a shaft system using SCUBA to a depth of 23 fsw for 44 mins. Approx 26 hours after surfacing diver complained of pain and weakness of left foot and tightness across right chest area. Diver recompressed to 60 fsw and treated on TT 6 for AGE. Diver had complete relief five minutes into the treatment. No meds were used. No days loss of work and 28 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 57**

This 26 year old male EOD diver made an open circuit SCUBA dive to 37 fsw for 20 mins using a drysuit. During the dive the diver experienced difficulty controlling the buoyancy of his drysuit. Approx 1 hr after the dive the diver complained of a dull pain in his neck apound (*sic*) the area of the spinal cord. A neuro exam was conducted with no other symptoms noted. Diver recompressed to 60 fsw and treated on a TT6 for AGE. No meds were used. No days loss of work and 42 days restricted from diving.

**NMRI Diagnosis:** Uncertain if decompression illness or not

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 58**

This 22 year old male EOD diver made an open circuit SCUBA dive to 40 fsw for 20 mins. During the dive the diver lost his weight belt and was unable to control his ascent to the surface. Upon surfacing the diver felt disorientated (*sic*). Neuro exam revealed weakness of right arm and leg. Diver recompressed to 60 fsw and treated on TT 6 for AGE. No drugs were used. Diver had complete relief 51 mins into the treatment. No days loss of work and 14 days restricted from diving.

**NMRI Diagnosis:** Definitely decompression illness (Arterial Gas Embolism)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 59**

This 34 year old male Navy SPECWAR SOT tech made a SPECWAR dive using open circuit SCUBA. The dive was to 25 fsw for :40. Forty minutes after surfacing he complained of pain in the left hand. This may have been present during the dive and probably due to a grip maintained during the dive. The exam was normal and told to return if symptoms worsened. Later on that night he noticed paresthesia in the hand, a funny feeling in his left elbow, shoulder and lower back. He called in and was told to report ASAP. The exam this time was positive for neurological deficits. He was compressed to 165 fsw. First relief was noted :11 into the treatment and complete relief :16 later. A TT 6A with extensions at 60 and 30 fsw was completed. No meds were used, 2 days loss of work and 14 days restricted from diving. Final diagnosis was AGE by DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Arterial Gas Embolism

**Case 60**

This 19 year old male second class Navy diver made a ships husbandry dive using Mark 20. The dive was to 21 fsw for one hour and three minutes, no "D". The next AM while working out at the gym this diver noticed slight numbness and tingling in his right hand. He stopped his exercise and returned to the dive locker. His symptoms exacerbated during transit including numbness and loss of strength in the lower right extremity and a decrease in peripheral vision. The neuro at the chamber revealed six significant deficits. He was compressed to 60 fsw on O2. First relief was noted 8 minutes in to the treatment and complete relief during the second O2 period. A treatment table 6 was completed. No meds were used, no days loss of work and 28 days restricted from diving. Final (sic) diagnosis was DCS Type II by the DMO.

**NMRI Diagnosis:** Definitely decompression illness (Decompression Sickness)

**Naval Safety Center Diagnosis:** Type II Decompression Sickness